

HIGHWAYS BRIDGES  
AIRFIELDS  
EASY CONSTRUCTION

# ROADS AND STREETS

APRIL 1950

Only TIMKEN® brings you a complete  
Rock Bit Engineering Service—with a choice  
of all 3 rock bit types!

*THIS NEW BOOK TELLS YOU ALL ABOUT IT! Shows full line of TIMKEN Rock Bits—in actual size. Gives advantages of every type. Tells how TIMKEN'S Rock Bit Engineering Service helps you.*

Only Timken gives you a complete Rock Bit Engineering Service because only Timken makes all three types of rock bits! With all three—multi-use, carbide insert, and one-use—to draw upon, Timken Rock Bit Engineers can bring you the bit performance your job demands, whether it is lowest bit cost, lowest cost per foot, greatest possible drilling speed, maximum production, or other desired advantages.

Timken's new rock bit catalogue tells you all about the Timken Rock Bit Engineering Service. It describes the full line of Timken rock bits—shows them in actual size—gives complete data on each bit series. Everyone who buys rock bits should have this book. For your free copy of catalogue S-6874 write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

## TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

...YOUR BEST BET FOR THE BEST BIT  
...FOR EVERY JOB



1  
Timken standard  
multi-use  
rock bit.



2  
Timken standard  
carbide insert  
rock bit.



3  
Timken one-use  
'spooncock'  
rock bit.

**TIMKEN**  
TRADE MARK REG. U. S. PAT. OFF.  
**REMOVABLE ROCK BITS**

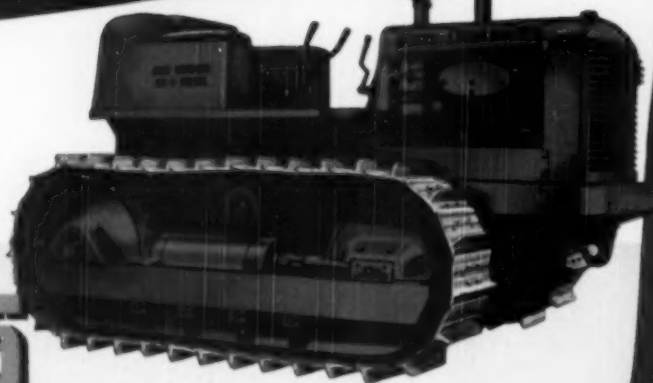
**YOUR BEST BET FOR THE BEST BIT  
... FOR EVERY JOB!**

# THE MOST VERSATILE TRACTOR EVER BUILT

...with its  
Wide Range  
of  
FULLY  
MATCHED  
Allied  
Equipment

ALLIS-CHALMERS

## HD-5



Engineered Completely New from the Ground Up ®  
with Big Tractor Design, Balance and Stamina

**Weight:**

10,500 lbs.—44" tread  
11,250 lbs.—60" tread

**Speeds:**

5 forward, to 5.47 m.p.h.  
1 reverse, to 1.99 m.p.h.

**Horsepower:**

40.26 drawbar

**Engine:**

General Motors 2-Cycle Diesel

THOUSANDS NOW IN SERVICE



BAKER

Hydraulic Bulldozers and Grade-builders (track or engine-mounted models).

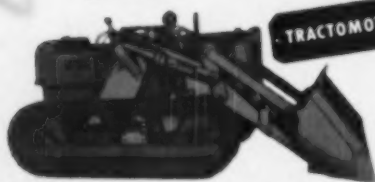
Root Ripper (interchangeable with bulldozer or gradebuilder moldboards).

Hydraulic "V" Snowplows with Wings.



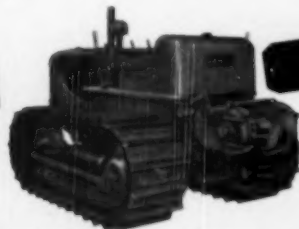
DROTT

**SKID-LOADER** with interchangeable racks for transporting, loading and unloading pulpwood, logs, stumps, lumber, ties, slabs and edgings, slash, mine props and other wood.



TRACTOMOTIVE

**TRACTO-SHOVEL** with interchangeable attachments for handling a wide variety of jobs — dirt, material and rock-handling buckets, bucket teeth, bulldozer and angle-digger blades, lift fork, crane hook, trench hoe, V-type snowplow, drag bucket, line fork and rock fork.



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Straight and Angle Blade Hydradozers.  
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Winches for construction, logging, oil fields, other operations.

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GARWOOD

Hydraulic Bulldozers and Dozercasters.

2-Wheel Hydraulic Scrapers (Hydraulic system optional. Scraper can be hooked in with bulldozer or Tracto-Shovel hydraulic system).

NOT TIED DOWN TO SPECIALIZED DUTY—YET GIVES SPECIAL PERFORMANCE ON EVERY JOB

"Seeing Is Believing"  
...Ask Your  
**ALLIS-CHALMERS**  
Dealer For A  
Demonstration

# ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

For Greater Production...

For Easier Operation...

For Simplified Servicing





Starting the hole through south side of mountain. Workmen take cover behind trucks as rock is blasted. Rock removal continued for weeks before "holing through."



Bethlehem Reinforcing Bars in place at tunnel entrance. Entire project used approximately 340 tons of Bethlehem reinforcing steel.

## Twin-Bore Parkway Tunnel in Connecticut



After tour of inspection during construction. Left to right: Harold Defelice and L. G. Defelice, contractors; W. C. Maynard, project engineer, State of Connecticut; and Wesley Brandt, chief of survey party.

To provide a faster, more direct route for motorists using the Wilbur Cross Parkway in the New Haven vicinity, the Connecticut Highway Department recently authorized construction of a twin-bore tunnel through West Rock, a mountain west of New Haven. The new tunnel is 1200-ft long, and each tube accommodates two lanes of traffic. It is equipped with automatic ventilating equipment and traffic control signals, and an elaborate lighting system which approximates at all hours the day or night conditions outside the tunnel. Contractors: L. G. Defelice & Son, Inc., New Haven, Conn., and Gull Contracting Co., Flushing, N. Y. Reinforcing steel was furnished by Bethlehem.

**BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.**

*On the Pacific Coast Bethlehem products are sold by  
Bethlehem Pacific Coast Steel Corporation  
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Dowel Units • Reinforcing Bars • Bar Mats • Guard Rail  
Guard Rail Posts • Wire Rope and Strand • Pipe  
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Bird's eye view of the tunnel as construction work nears completion at south portals. Note continuation of highway on far side of mountain.



Twin portals at north end of tunnel. The shaft house, which provides outlet for ventilating system, is shown above and between portals, among trees.

**When writing advertisers please mention ROADS AND STREETS, April, 1950**

# ROADS AND STREETS

April, 1950

Vol. 93

No. 4

Roads and Streets represents 58 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892

E. S. GILLETTE, Publisher

CCA

HALBERT P. GILLETTE, Editor-in-Chief

## Coming Articles

### Mechanized Maintenance

We've all heard much about the increasing effort to apply modern machinery such as loaders, graders, tractors, etc., in highway upkeep . . . A national round-up of facts will be given . . . also county case stories in months ahead.

### Bridges—No Two Alike

Every large bridge job presents a different set of problems. How the contractor on a \$4 million dollar Southern project re-used his steel forms 15 to 60 times, will be described in a forthcoming article. 130 ft. deep open cofferdams also made this job notable.

### A Texas County Tries "Economy" Bridge

Eight bridges on farm-to-market roads were built by a Texas County recently, using standard re-usable steel and wood forms. Costs as low as \$50 a running foot for permanent concrete single and multiple span structures . . . to a design that might save money on thousands of similar structures and open up a market for enterprising small contractors.

### Concrete Paving

A heavy airport slab involving sawed dummy joints . . . Refinements in Ohio's specifications and design standards . . . A Texas engineer reviews joint and other design details.

### Grading

Each month (we hope) watch for reports on well-equipped and fast paced grading jobs . . . Feature articles . . . also "Knockin' out the Yardage" department.

### Bituminous

Watch for a varied series of new subjects in Bituminous Roads and Streets.

### Soil Mapping

Applications and usefulness reviewed.

### Slide Presentation

An Ohio case study of a "bad acting" riverside road and what was done to bring stability.

HAROLD J. McKEEVER, Editorial Director  
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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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# B.F. Goodrich



## BFG users report: Continued savings —thanks to double bruise protection

**B.** F. GOODRICH *Universals* were reported by one operator to be in good condition after daily quarry service for over 21 months. Another operator reports over 4500 service hours from *Universals* against only 1600 hours from another make in identical service. Still another report told of tires that were still "young" at 3200 hours and probably good for thousands more. These actual user reports spotlight the great difference between various makes of off-the-road tires.

When results are measured, BFG tires always stand high. There are many reasons for the continuing top performance of B. F. Goodrich tires. For example, notice the tread on the

*Universals* in the picture above. It's designed to give traction both ways. More than that, it is made of specially compounded rubber . . . armor against sharp rocks and other tire killers.

Also, BFG tires have double bruise protection in the form of a *double nylon shock shield* . . . layers of nylon cord built between the tread and the body plies. Under impact, the strong, elastic nylon shields the cord body. And there are two shields for double protection!

Only B. F. Goodrich gives you the added protection of the nylon shock shield; the added savings from (1) longer tire life (2) increased bruise resistance (3) less danger of tread sep-

aration (4) more recappable tires. Nylon shock shield costs no extra—you pay no premium.

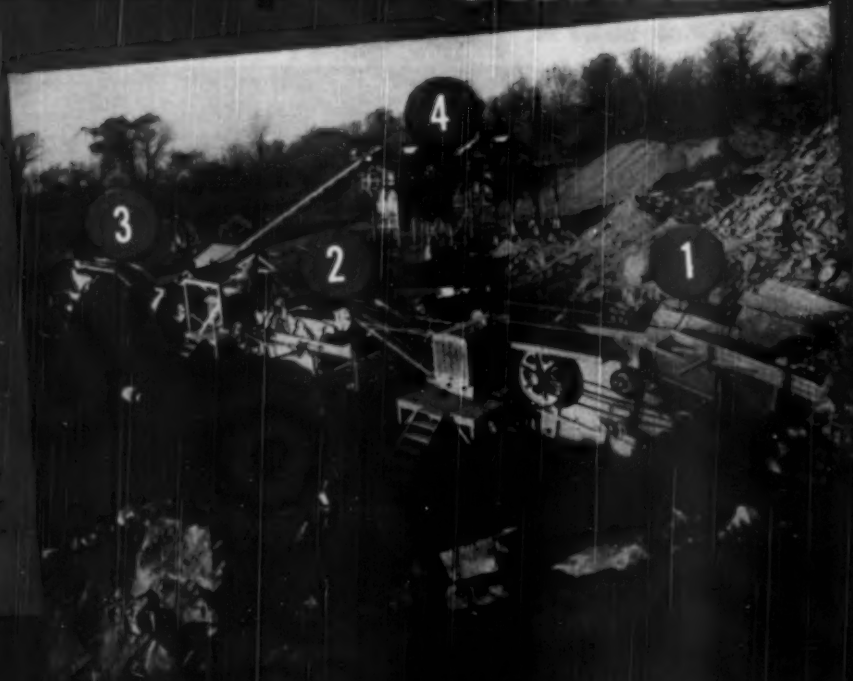
There's a specially designed \*BFG off-the-road tire for every need. See your B. F. Goodrich dealer or call The B. F. Goodrich Company, Akron, Ohio.



\*Typical example: New ALL-NYLON tire for tough construction projects, quarry work, strip mining, etc. In all tests not a single tire blew out, not one flex break occurred!

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YOU get big volume production for big volume jobs when you use the Cedarapids Unitized Plant. With these four facilities, you can crush to a desired product size, or undersize, you can meet any quarry conditions, any capacity requirements from 25 to 250 tons per hour, any finished product specification, and rip up to sections, all with big volume efficiency and economy. Write for Bulletin UNIT-2 for complete details.



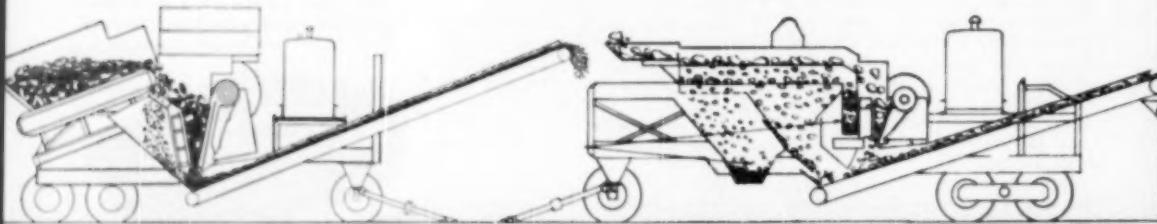
## FOUR BASIC UNITS MEET EVERY AGGREGATE

1

**PORTABLE PRIMARY CRUSHING UNITS** handle the crushing of raw material, reducing it to a size readily handled by the scalping unit or secondary. Easily moved to meet every job requirement. Available in a size to fit your needs.

2

**SCALPING UNITS** remove excess fines and crush the material to reduce the circulating load on the secondary. They can also be used for making specialized products, and where oversize is not too large, they can be used for primary crushing. Choice of sizes.



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Built by  
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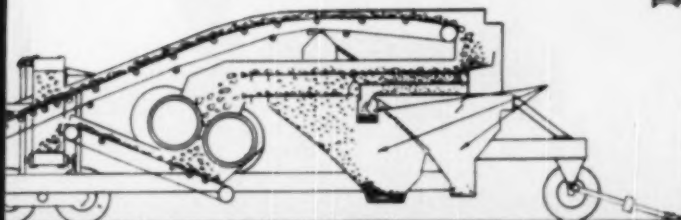
MAXIMUM  
PRODUCTION

MAXIMUM  
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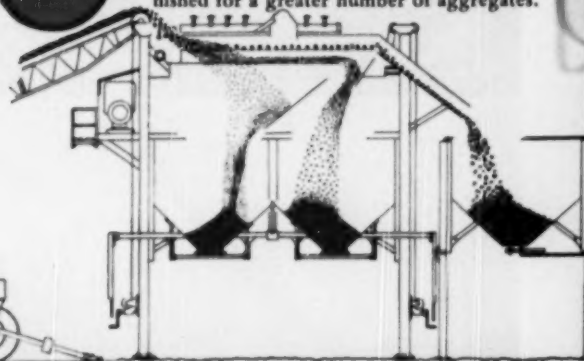
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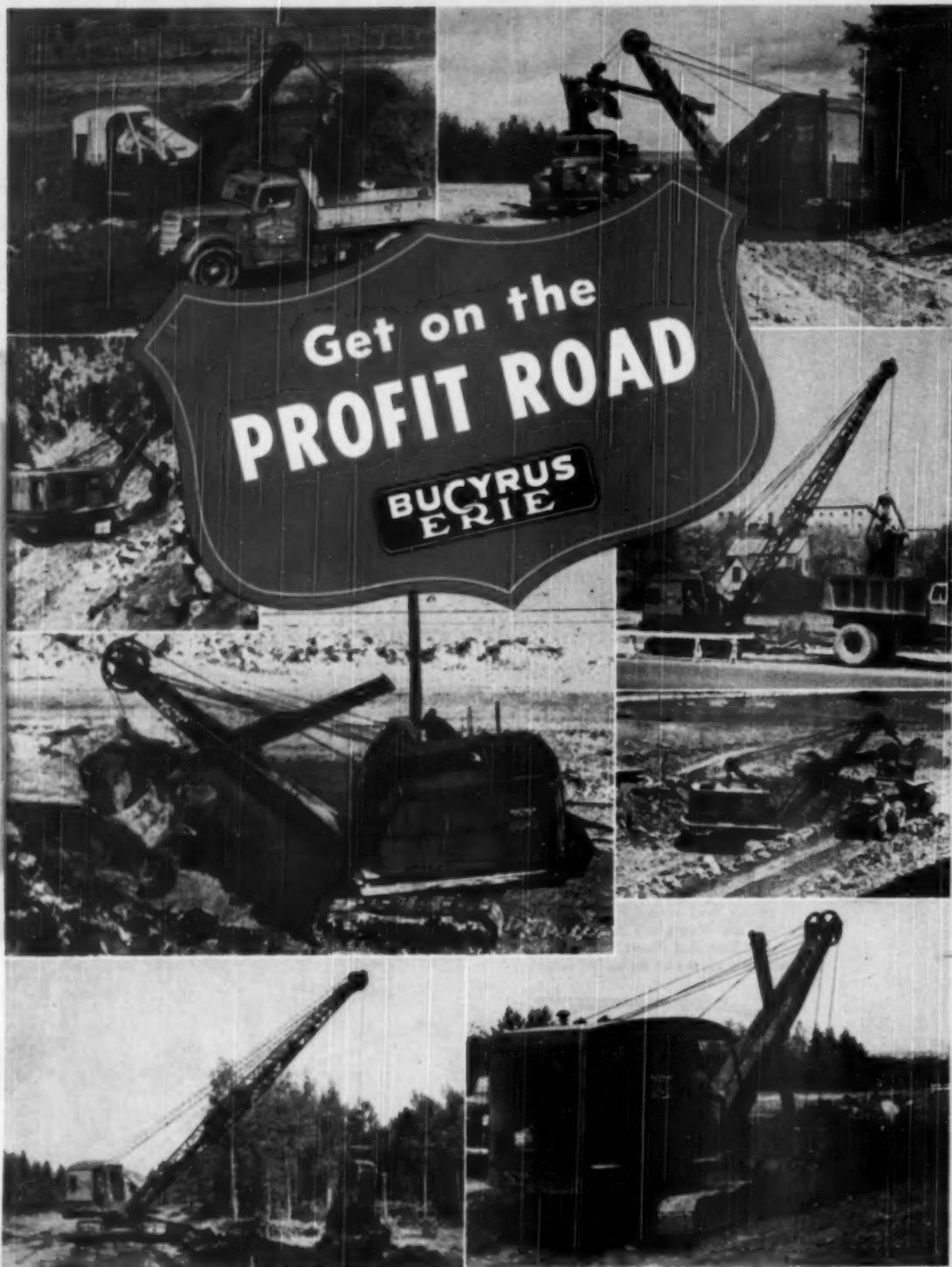
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**WET OR DRY SCREENING UNITS** consist of a 2-compartment bin and double-deck screen. Washing attachments can be added for washed aggregate. Additional bins can be furnished for a greater number of aggregates.



# **IOWA MANUFACTURING COMPANY**

**Cedar Rapids, Iowa, U.S.A.**





There's a fast, efficient, dependable Bucyrus-Erie  
in the size and capacity you need to put your  
highway jobs on the profit road. See your Bucyrus-  
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ing  $\frac{3}{8}$ - to 2½-yard convertible excavators.

**BUCYRUS-ERIE COMPANY**  
SOUTH MILWAUKEE, WISCONSIN

# CHAMPION

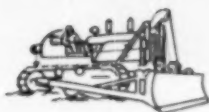
## WORKIN'EST

Here are some of the exclusive features that give the TD-24 its matchless work capacity:

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6. High-speed track assemblies with new recoil mechanism that holds front idlers in position against full-load track pull.

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**CRAWLER TRACTORS • WHEEL TRACTORS**  
**DIESEL ENGINES • POWER UNITS**





# of Crawlers

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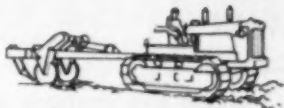
while the other tractors have to switch to low to make it." And the TD-24 hauls a 17-yard scraper, heaped! ● Yes, the TD-24 is the "workin'est tractor" on any job. Yet, its operator is the worker with the easiest day! See your International Industrial Power Distributor. Get a TD-24 demonstration. Discover how you, too, can save job time, cut costs, earn extra profits.

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*True in  
James Melton and  
"Harvest of Stars,"  
—NBC, Sunday  
afternoons*



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**O**WNERS of General Motors Diesel engines and GM Diesel-powered equipment know they can depend upon receiving courteous service *after* as well as *before* the sale. They know that, wherever they are, a GM Series 71 Diesel Distributor or Dealer is ready to answer call for a quick tune-up, a repair or a Factory-Engineered GM Diesel

part. Staffs of factory-trained service men have the tools, the know-how and a thorough, capable interest in seeing that every engine delivers its best. Here, for your convenience, is a list of GM Diesel Industrial Distributors and Dealers in strategic locations throughout the United States.

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*Diesel Brawn  
Without the Bulk*



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Here is a mobile, utility-size trencher — Parsons rubber-tired Model 80 Trenchmobile — for handling off-street connections, installing conduit, gas lines, water services, in new subdivisions, on airport maintenance, etc. All those small, tedious trenching operations formerly done by slow, costly hand methods can now be handled in much less time, at less cost, and less supervision with this one-man operated Trenchmobile. Opens new profit possibilities to small contractors . . . fills an important need in speeding up schedules of public utilities and municipalities.

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Trenchmobile's wide range of traveling and trenching speeds gets more jobs done per day. Cuts smooth-walled trenches in the toughest digging . . . special crumber attachment provides clean trench bottom. No costly hand trimming. Over 40 years of Parsons trencher engineering experience has gone into its rugged, heavy-duty design . . . trenches up to 4-feet deep, 5" or 8" wide. Check what its many exclusive features can mean to you . . . then see your Parsons distributor for complete facts, or write for illustrated bulletin.

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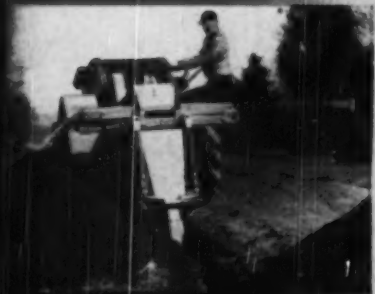
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Heavy-duty Trenchmobile is small, compact . . . wheelbase, 4'11" . . . 20 h.p. engine provides 8 digging feeds forward to 14.50' per min., 4 reverse . . . plus travel speeds from 2.54 to 18.9 m.p.h.



Controlled discharge lets Trenchmobile work of loading in close quarters . . . reversible conveyor discharges spoil on either side; reverse traction gives horizontal action against foundation walls . . . no hand work. Steep boom positions side, undercuts, cuts and gutters.



Revolving door blade (optional) doubles Trenchmobile versatility. Does a first job of backfilling. Trenchmobile's fast roadability cuts time between jobs; increases work time and profits. Automatic type steering and truck type hydraulic brakes give positive, safe control for travel on highways and city streets.

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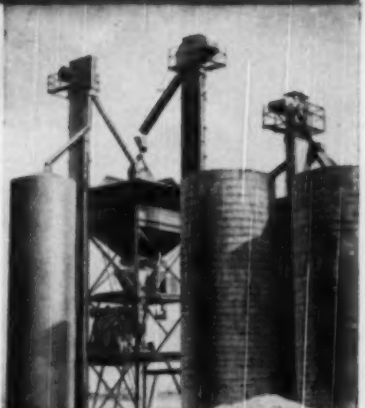


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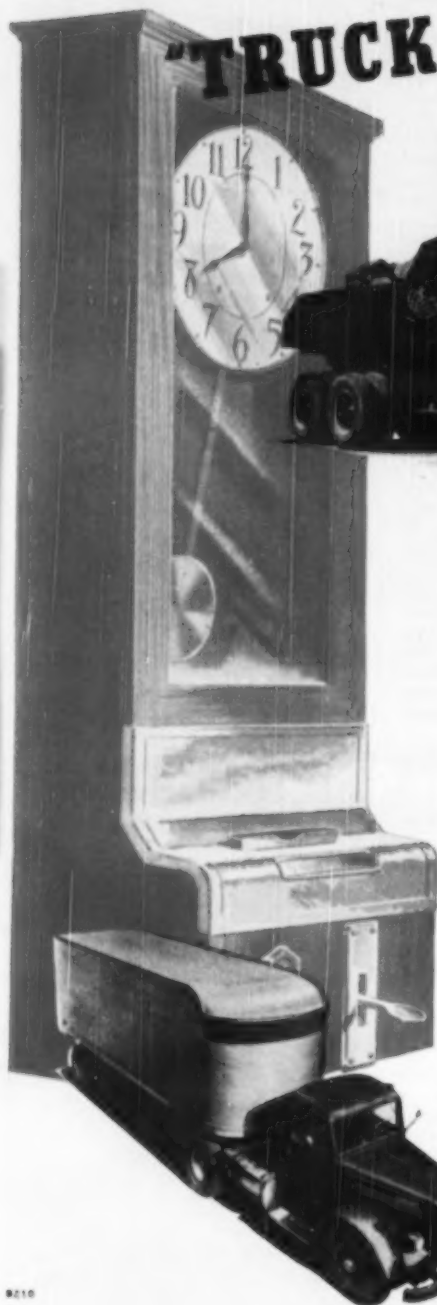
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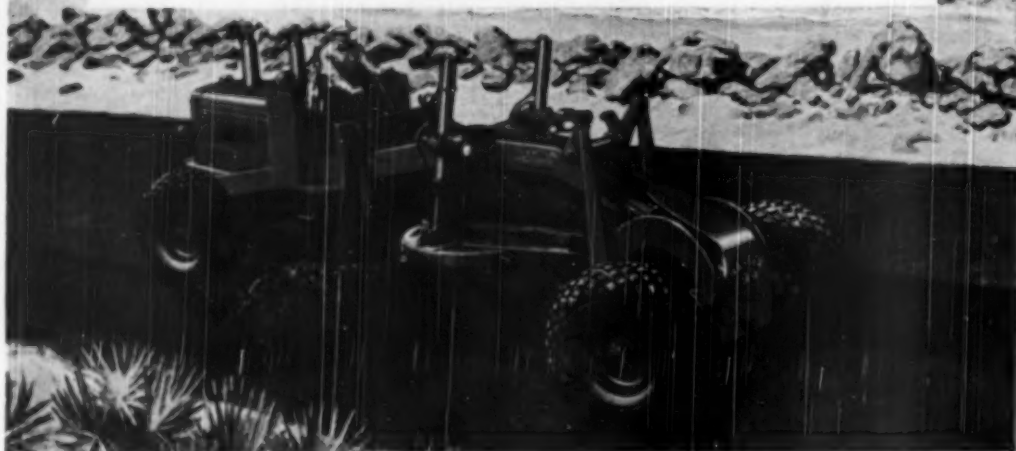
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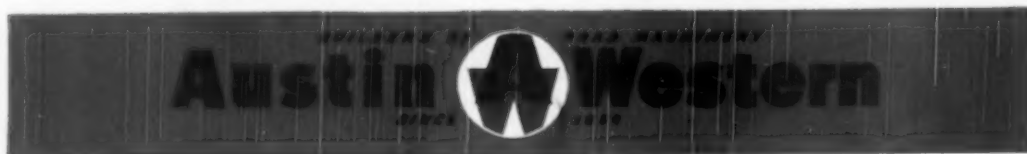
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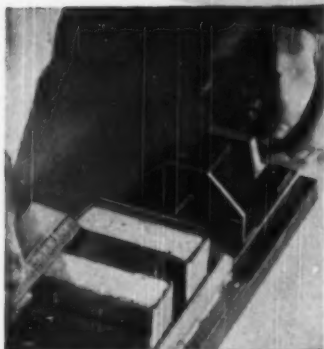
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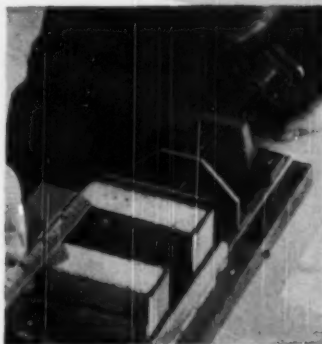




*We S-T-R-E-T-C-H-E-D a point...*



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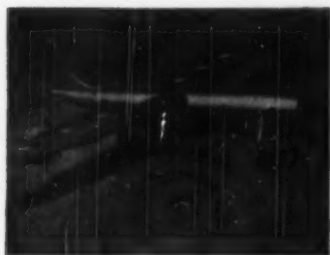


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Extended double to 3 inches, Flintseal maintains perfect bond.

*...to PROVE one!*



• They keep getting bigger! The Consolidated-Vultee B-36 can carry an atom bomb anywhere in the world and return. Sky giants like this must have heavy runways. Flintseal Joint-Sealing Compound increases service life, reduces maintenance cost and seals joints positively.



• With more traffic than ever before on our highways, maintenance becomes even more important. Flintseal helps cut maintenance to the bone, because its bond remains firm and tight through repeated cycles of expansion and contraction.

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Manufactured by The Flintkote Company

It happened like this.

We were demonstrating the extensibility of Flintseal® Joint-sealing Compound as required by Federal Specification SS-F-376a . . . (3 cycles of extension from 1 to 1½ inches at 0° F. and recompression at room temperature).

Then, showing what Flintseal would really do, we extended to 3 inches. Three times its original width instead of half again as wide.

And the bond of Flintseal to the test blocks remained as firm as ever!

We admit that's stretching a point. Joint-sealing Compound probably would never be called on to perform like that. But isn't it a comfort to know that materials you use have that additional factor of adhesion and safety?

You get that and more with Flintseal. It's a rubber-bearing, thermo-

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# GREAT GRADERS

**T**HERE'S no guessing about the performance of "Cat" Diesel Motor Graders with John S. Pukrop, Contractor, Ivanhoe, Minnesota. He knows from experience that these husky yellow machines deliver 60-minute hours day after day. And that's half the battle in figuring and making profits on a job.

Here you see his "Cat" Diesel No. 12 Motor Grader busy on Pipestone County Highway No. 4 near Ruthton, Minn. Right on the heels of rough grading, it's finish grading 9.5 miles of 30-ft. highway. There's no time lost making repeated passes—the No. 12's positive controls keep the tough blade on the beam. But let's get the over-all picture directly from Mr. Pukrop, who says: "In my book the No. 12 is the best of all graders

and most economical to operate. It has many uses, of course, but we use it for grade finishing. Two miles per 10-hour day is the average, but it could do more if the rough grade was far enough ahead. 'Caterpillar' machines are by far the best on the market."

Whatever the grading job, there's a "Cat" Diesel Motor Grader the right size to do it most efficiently and economically for you. And there's a capable "Caterpillar" dealer near-by who's ready round the clock to give you "Johnny-on-the-spot" service. He sincerely believes this rugged yellow machine is the best in the field. Ask him for full proof of its performance!

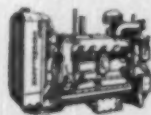
CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS



Only "Caterpillar" designs and builds every part of the famous "Cat" Motor Graders. This undivided responsibility is your assurance of a long life of efficient, economical performance.



Each of the 3 sizes of "Cat" Motor Graders is a completely different machine. There's no performance penalty due to excessive frame weight, too little power or poorly matched working parts.



Only "Caterpillar" Motor Graders have the dependable yellow engines—the power plants that are world famous for delivering 60-minute-hour performance every hour day in and day out.



Lubricating oil is cooled in this radiator section to minimize carbon lacquer and gum formations—enemies of long engine life. Lower temperatures preserve the lubricating qualities of the oil.



Safe and sure Diesel starts are assured by this electrically started gasoline engine. It warms the coolant and allows the Diesel to circulate "lube" oil before actual starting.



Castings like this cylinder head on "Cat" Diesels are made right in "Caterpillar's" own foundry, where tolerances and quality can be closely controlled—another example of precision engineering!

# CATERPILLAR

REG. U. S. PAT. OFF.

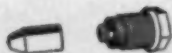
ENGINES • TRACTORS • MOTOR GRADERS

...and here's  
the proof!

This "Cat" Diesel No. 12 Motor Grader is one of the fleet of "Caterpillar" equipment owned by John S. Pukrop, Contractor, Ivanhoe, Minn. Other big yellow machines include five D8 Tractors, two D7 Tractors, a DW10 wheel-type Tractor and No. 10 Scraper.



Typical of "Caterpillar" quality are these aluminum alloy pistons. Tops are oil sprayed for coolness and long life. Cast iron compression-ring belt keeps this vital ring working at top efficiency.



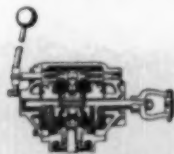
"Caterpillar"-built fuel injection equipment is trouble-free and fool-proof. Injection capsules and pumps can be replaced on the spot in the field — no adjustments are necessary.



Exclusively "Caterpillar," these solid aluminum "con" rod bearings give low rate of wear, ability to carry heavier loads, exceptional heat transfer characteristics and high corrosion resistance.



"Caterpillar" Motor Graders are designed for exceptionally good operator visibility. Sitting down, the operator can see toe and heel of the blade with equal ease. That helps keep jobs moving.



Mechanically operated controls give the user the constant control that is so necessary for precision work. They're quality built — changes in temperature do not affect them.



"Caterpillar's" exclusive side-shift mechanism allows extreme blade positions without the need for manual adjustment of linkage. You'll find this a real work- and time-saver on the job.

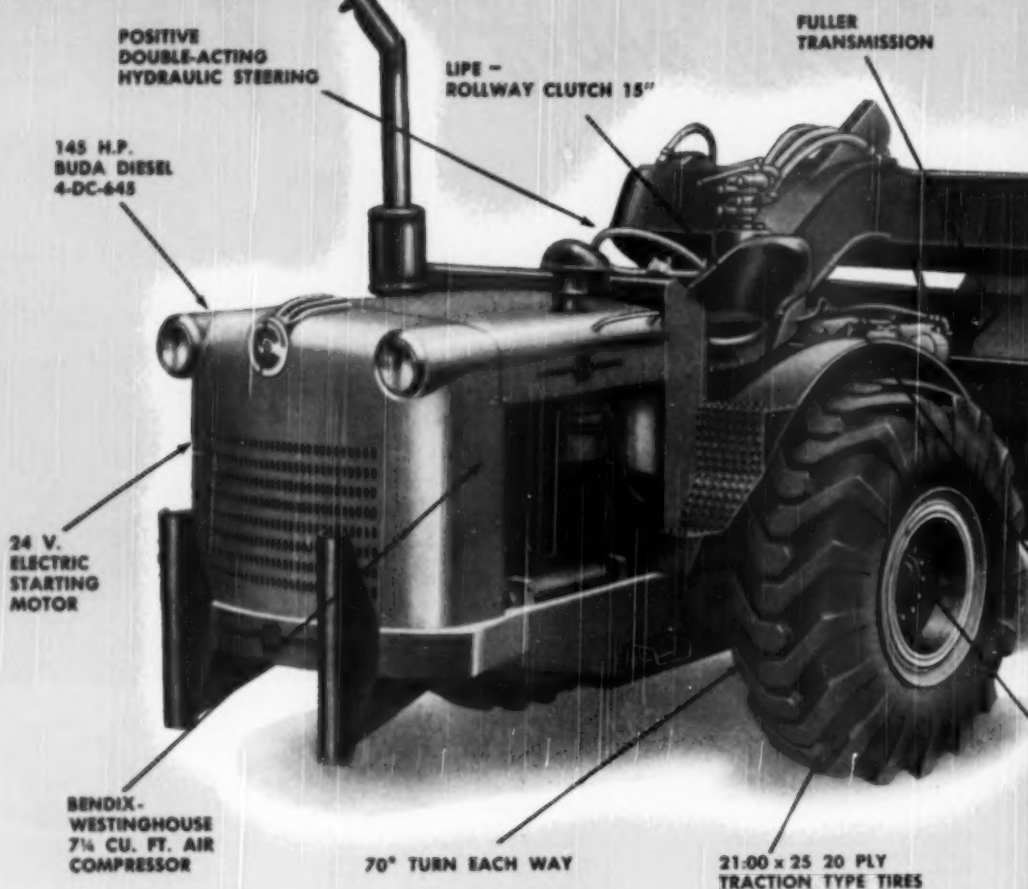
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1 CU. YDS. STRUCK  
2 CU. YDS. HEAPED

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Speedy, agile and powerful, the "200" is small enough for all those small yardage odd jobs and utility work and yet has all the capacity and speed necessary for real high production earthmoving on those long haul jobs.

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**move 3,000 yards  
a day on 2 mile  
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On a one-mile, one-way haul, Muskoka's two high-speed Rockers moved 150 yards of mixed sand and rock an hour . . . 3,000 yards every 20-hour working day. Tournarockers had no trouble maintaining continuous operation over soft sandy haul road. Cycles were fast . . . because rig's big target area (11'2" x 7'10") speeded shovel loading, decreased spillage . . . short 90° turn and positive electric steering by push-button control permitted quick, easy maneuvering . . . powerful

brakes with 4108 sq. in. of braking surface allowed high-speed hauling.

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Dump, too, was fast . . . simple, electric hoist tilted the streamlined body in a few seconds. "Whatever rock we load into our Rockers unloads easily because of the rig's fine ejecting principle," says Mechanical Superintendent William C. Knight. "Have used our Tournarockers in sticky materials too, and had no trouble dumping the loads."

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Tournarocker's many advantages for big payloads and fast cycles gave Muskoka Company the lowest-cost answer to their hauling problem. That's why Knight says, "Tournarockers are the best hauling units any contractor could ever purchase."

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# REPLACE 15 DUMP TRUCKS

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Big 11'2" x 7'10" top opening, plus low entry from rear, give shovel operator an easy-loading target. These 16-ton 1st-Tourneau rock loaders maneuver in close, about 150 yards of rock an hour.

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There's nothing else like T6 and T7 TRAXCAVATORS in the heavy-duty equipment field for multi-purpose usefulness and big production. Nothing less than a fleet of assorted, limited-use machines can match a big TRAXCAVATOR at digging, stripping and loading broken pavement and soils as tough as they come!

That tells you why big TRAXCAVATORS get the call to strip and load thousands of tons of brick, blacktop and concrete pavement.

It shows, too, why these big units perform the functions of various specialized equipment on other road and street jobs. They prepare sub-grade; widen shoulders; charge crushers and mixers; help produce surfacing materials, dig, grade, carry and load. All at record low cost!

Besides their production advantages, TRAXCAVATORS are *unit-engineered* with their matching "Caterpillar" Diesel Tractors, for long life and low upkeep. Built in 5 models (1/2 to 4 cubic yards capacity), the TRAXCAVATOR line offers you the greatest range of sizes — providing a size for every job and purpose. See your TRACKSON-"Caterpillar" Dealer for full information. Or write TRACKSON COMPANY Dept. RS-40, Milwaukee 1, Wisconsin.

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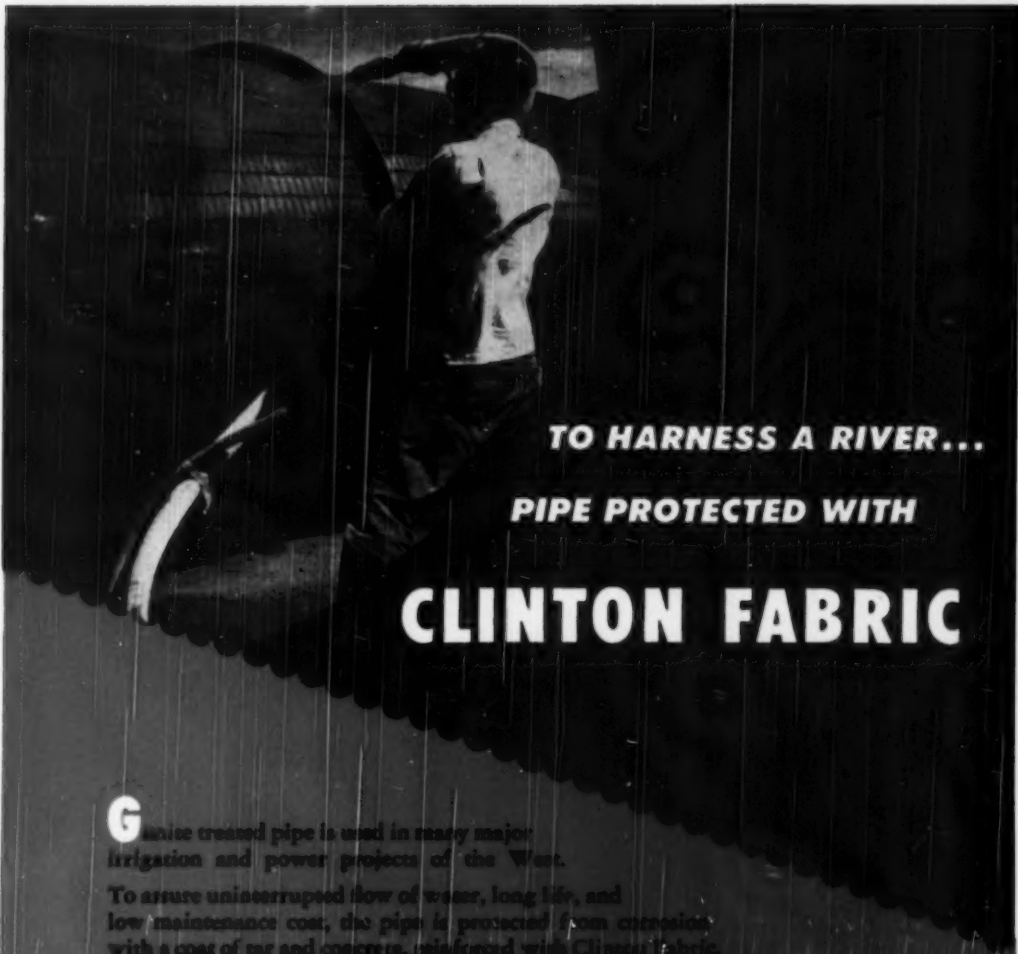
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CONSTRUCTION







**TO HARNESS A RIVER...**

**PIPE PROTECTED WITH**

**CLINTON FABRIC**

**G**alvanneal pipe is used in many major irrigation and power projects of the West.

To assure uninterrupted flow of water, long life, and low maintenance cost, the pipe is protected from corrosion with a coat of tar and concrete, reinforced with Clinton Fabric.

The Clinton Welded Wire Fabric reinforces the concrete... makes the concrete shell tough enough to stand up under handling with cranes... controls cracking of the concrete and assures the permanency of the installation.

Specify CFI Clinton Welded Wire Fabric to reinforce concrete pipe, highways, and other concrete structures.

AMONG OTHER CFI PRODUCTS:

BEALOCK FENCE, WICKWIRE ROPE, CUTTING EDGES FOR SCRAPERS,  
DOZERS, GRADERS, AND SNOWPLOWES



**The Colorado Fuel and Iron Corporation**

GENERAL OFFICES: DENVER, COLORADO

IN THE EAST: WICKWIRE SPENCER STEEL DIVISION, BUFFALO, NEW YORK  
ON THE PACIFIC COAST: CALIFORNIA WIRE CLOTH CORPORATION, OAKLAND 4, CALIF.



## WELDED WIRE PIPE FABRIC

### *Specifications:*

**WIRE:** Shall conform to the Standard Specifications for cold-drawn Steel Wire for Concrete Reinforcement (A.S.T. M. Designation A-82) of the American Society for Testing Materials.

**FABRICATION:** Assembled by automatic machine which assures accurate spacing and alignment of all members; all wires securely connected at intersections by a process of electrical-resistance welding; the entire operation in accordance with Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement (A.S.T. M. Designation A-185-37).

**GAUGE RANGE:** Transverse Wires No. 14 Gauge to No. 0 Gauge.  
Longitudinal Wires No. 14 Gauge to No. 000 Gauge.

**SPACING RANGE:** Transverse Wires 2" minimum increasing to 16" maximum by 1" increments (excluding 11", 13", and 15" spacings.)  
Longitudinal Wires 2" minimum increasing by 1/2" increments.

**LENGTHS:** Rolls—To and including 300.

**WIDTHS:** Furnished in widths and with overhang suitable for reinforcing concrete pipe.

**PACKAGED:** In Rolls

**The Colorado Fuel and Iron Corporation**

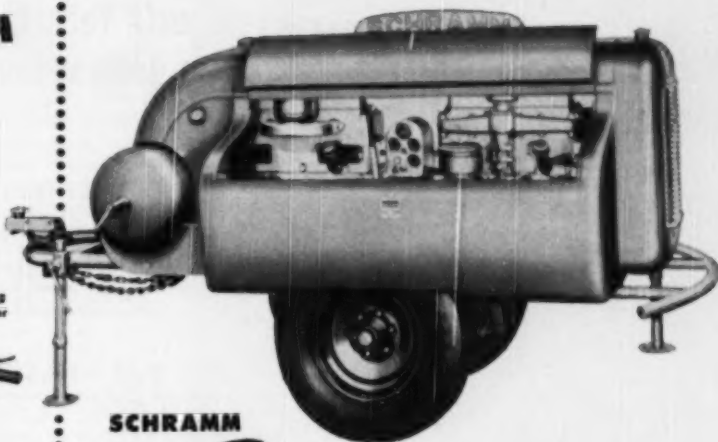
GENERAL OFFICES: DENVER, COLORADO



# SCHRAMM

is definitely  
your best buy in Air Compressors  
Because...

## SCHRAMM TOOLS



### SCHRAMM

HAS *Pneumastat*

Fuel Saver Up To 50%!

The SCHRAMM *Pneumastat* gives you the advantages of: Higher average working pressure—more work from your tools... Simple and rugged construction—no valves, no checks, no pistons. Longer compressor and engine life... Lower maintenance costs... Requires no service or adjustment.

### SCHRAMM HAS UNIPOWER ENGINE

Greater lugging power • Expressly designed for compressor load, speed, torque, field conditions, easy starting, continuous 24 hour service, and remote operation without attendants.

### SCHRAMM HAS SIMPLIFIED DESIGN

UNISTAGE eliminates two staging and intercoolers • Fewer parts—90% of engine parts interchangeable with the compressor.

### SCHRAMM PROVIDES PLUS FEATURES

Tool boxes large enough for complete assortment of pneumatic construction tools • Easy winding, full capacity hose reels • Stronger air tanks—400# test • Watercooled—can be operated with doors in place • Dual fan belts • Heavy grill for radiator protection.

In addition, Schramm Inc. also offers their complete line of Golden Anniversary construction tools—a few of which are illustrated at the left. For full details write today for Bulletin SCT-50.

# SCHRAMM INC.

*The Compressor People* • WEST CHESTER • PENNSYLVANIA



# TRUSCON Welded WIRE FABRIC

## reinforced concrete...



### PRECISION DESIGN



Reinforced concrete can be accurately designed to carry specified loads, and engineers know in advance that it can and will carry the loads for which it is designed.

### LOW ANNUAL COST



Cost analyses of hundreds of thousands of square yards of both reinforced concrete and flexible type pavements prove that concrete is lowest in annual cost.

### SPREADS THE LOAD



The subgrade underneath any pavement ultimately has to sustain the loads put upon the pavement. Reinforced concrete, being a rigid material after it hardens, spreads the load over a wide area of subgrade.

### LOW MAINTENANCE



Records from 27 state highway departments - all of which segregate surface maintenance costs from other items of expense - covering an average period of 13 1/4 years show that surface maintenance on all other types costs from 49 per cent to 600 per cent more than for reinforced concrete.

### LOW FIRST COST



To bring a flexible type pavement up to the load-carrying capacity of a rigid type reinforced concrete pavement would require such a depth of material as to make the cost excessive.

### LONG LIFE



Because reinforced concrete is a strong rigid material, it has long life, free from periodic repairs and reconstruction. Actual experience records in the field have shown that concrete has an expected life of approximately twice that of flexible types.

## best for toughest service

Millions of wheels pound  
millions of miles of reinforced concrete highways  
every day. Under this constant punishment—*growing heavier each year*—reinforced concrete has proved itself the most permanent and the lowest-cost-per-year of all the highway materials. Truscon Welded Wire Fabric gives these advantages to concrete: Resistance to cracking during setting period... Tensile strength against subgrade friction... Resistance to cracking due to warping... Resistance to development and opening of cracks... Resistance to slab separation... Decrease of spalling and disintegration.

Write for illustrated literature.



FREE Book on Truscon Welded Wire Fabric. Write for it. The Truscon Steel Company manufactures a Complete Line of Welded Wire Fabric... Concrete Bars... Construction Joints... Dowel Assembly Units... Curb Bars... Complete Steel Buildings.

## TRUSCON STEEL COMPANY

Subsidiary of Republic Steel Corporation  
YOUNGSTOWN 1, OHIO  
Warehouses and sales offices in principal cities





**WITH BOTTOM DECK FEED** only pit run is fed to the bottom deck of the 3 1/2 deck screen. Half deck rejects sand. Pit run specification goes to pay hopper without going through a crusher... passes through only one screen. Oversize goes to jaw crusher.



**ONLY CRUSHED MATERIAL** is screened on the top deck. Specification material is by-passed around the bottom deck to the pay hopper. It does not pass through the bottom deck. No scalping screen is necessary. Stone chips can be produced if desired.

## How a twist of the wrist increases production with BDF

**IN YOUR BUSINESS**, time is measured in rock and gravel tonnage. Every hour of smooth, high speed, uninterrupted production is worth many dollars and cents of profit. *Time is money.*

With the invention of Bottom Deck Feed, Pioneer engineers found an ingenious way to pack more productive hours into every working day. This is done by eliminating the necessity of frequent screen changes... by permitting continuous adjustment of balance between the roll crusher and the jaw crusher—just a twist of the wrist—while the plant is in operation. (See detail at right)

And because the top and bottom decks both produce specification material independently, bottom deck feed can actually double the effective screening capacity of a plant. (See details above)

If you believe "one gravel plant is as good as another", send for our catalog on bottom deck feed plants. It shows in detail how this series of portable plants will out-produce any other plants built today. **PIONEER ENGINEERING WORKS, 1515 Central Avenue, Minneapolis 13, Minnesota.**



**THE FLOW OF MATERIAL** throughout the plant is regulated by a simple ratchet adjustment on the jaw crusher. If the material is coarse and the jaw is overworked, open the jaw slightly and send a larger product to the roll crusher. If the material is fine, close the jaw. You don't have to stop the plant to change screens. A twist of the wrist does it.



**BUY BOTH!**

Higher Output,  
Lower Upkeep!

**Pioneer**  
Continuous EQUIPMENT

*Mail coupon today!*

**PIONEER ENGINEERING WORKS**  
1515 Central Avenue • Minneapolis 13, Minnesota

● Please send me information on the equipment checked.

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> GRAVEL PLANTS | <input type="checkbox"/> WASHING PLANTS    | <input type="checkbox"/> MECHANICAL FEEDERS          |
| <input type="checkbox"/> ROCK PLANTS   | <input type="checkbox"/> BITUMINOUS PLANTS | <input type="checkbox"/> VIBRATING SCREENS           |
| <input type="checkbox"/> JAW CRUSHERS  | <input type="checkbox"/> APRON FEEDERS     | <input type="checkbox"/> BUZZER SCREENS (light duty) |
| <input type="checkbox"/> ROLL CRUSHERS | <input type="checkbox"/> GROUND FEEDERS    | <input type="checkbox"/> CONTINUOUS CONVEYORS        |

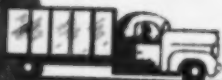
Name

Company

Address

City  Zone  State

# Do Motorists Need "Shoehorns" On Your Highways?



Why squeeze traffic through narrow structures when it is so easy to extend or replace inadequate culverts and bridges with Armco MULTI-PLATE? Costs are low, and you gain increased roadway for added safety.

A small crew can assemble the pre-curved MULTI-PLATE sections into a sturdy full-round pipe, arch or PIPE-ARCH in short order. Backfilling is done directly against the metal and you are ready for traffic. There is no costly formwork, no delay for curing.

Later on, should conditions change, your MULTI-PLATE structure can be extended or salvaged for re-use elsewhere. There is no loss of material.

MULTI-PLATE is just one of many Armco Drainage Products designed to meet your specific needs. There is PAVED-INVERT Pipe to combat erosion, ASBESTOS-BONDED Pipe for severe corrosive conditions, PIPE-ARCH for limited headroom and many more.

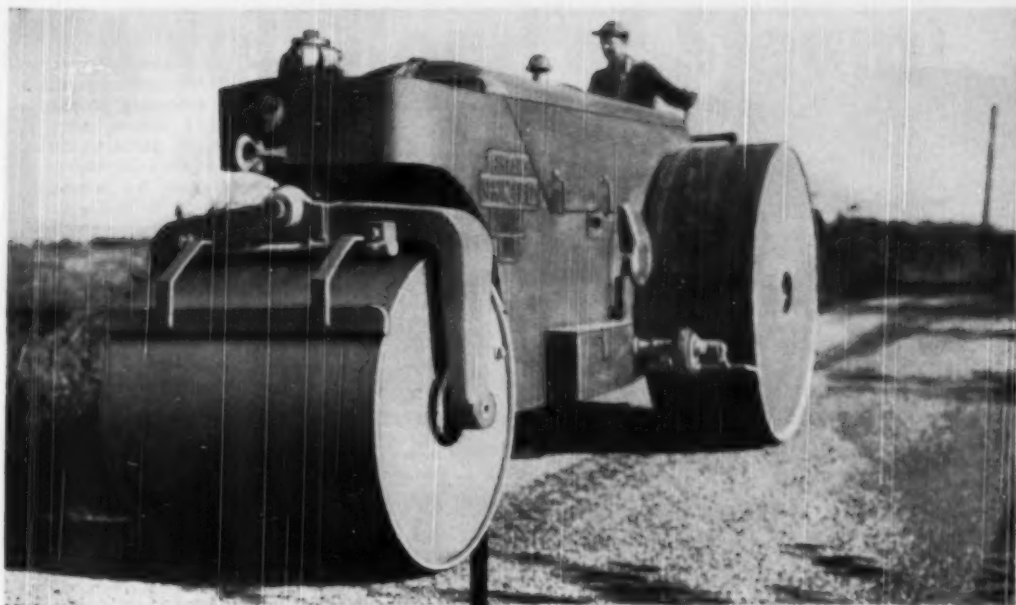
Whatever your drainage problem, it is likely you will find the quick, low-cost answer in an Armco Product. Write today for complete information. Armco Drainage & Metal Products, Inc., 4070 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation.

Export: The Armco International Corporation



## Armco Drainage Structures





## WORKHORSE 3-Wheel Roller Style

Buffalo-Springfield variable weight 3-wheel rollers are work-horses by any definition. No longer single-purpose machines, these new units far outstrip "old Dobbin" in ability to perform many different jobs with efficiency and economy.

For example, the Buffalo-Springfield model VM-18 is basically a 5-ton machine—but that's not all. It can perform work calling for a 6-ton or even a 7-ton machine. The VM-18's wide job versatility is made possible by ballast type rolls. Heavy steel head plates, welded to the roll tires and hubs, form water-tight compartments. Filling and drain plugs in the outer heads permit filling the rolls with water

to increase the roller weight. If even higher compressions are desired, shovel openings with bolted water-tight covers are provided so a mixture of water and sand can be used as the ballasting material. Thus—the VM-18 can be adapted to meet compression requirements that would normally call for three fixed capacity models.

Equally important, the roll surfaces are machine-finished for uniform smoothness and curvature, which means the VM-18 can also be used for finishing work. Thus, one variable weight 3-wheel roller is used for many applications and reduces the equipment requirements on any road building job.

There are seven Buffalo-Springfield variable weight models covering a range from 5 to 17 tons. Your nearest distributor can give you complete details on the model best suited to your needs. See him today.



MAIL THIS COUPON TODAY

THE BUFFALO-SPRINGFIELD ROLLER CO.  
Dept. E-4, Springfield, Ohio

☐ Please send me Catalogue S-40-50 describing the right model for my requirements. ☐ Notify Distributor to call.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_



Equipment of Hendrickson Brothers, Valley Stream, N. Y., moving earth to make way for a housing project at Great Neck, L. I. Among other recent big jobs of Hendrickson Brothers in that area is a \$6,500,000 sewage disposal plant for Nassau County, N. Y.

*"We have a 26-year record  
of dependable equipment performance  
with  
Gulf Quality Lubricants and Fuels"*

*says President A. J. Hendrickson*

*of Hendrickson Brothers*

"We have used Gulf products for over a quarter of a century because of outstanding quality and Gulf's ability to get products to us when and where needed," says Mr. Hendrickson.

The use of quality petroleum products is one of the surest guarantees of smooth, dependable equipment performance and low maintenance costs—which add up to speedier jobs and greater profits! That is why so many leading contractors engaged in all types of construction work specify Gulf quality lubricants and motor fuels.

Gulf products are available to you through

1200 warehouses located in 30 states from Maine to New Mexico. Write, wire, or phone your nearest Gulf office today.

**Gulf Oil Corporation • Gulf Refining Company**

GULF BUILDING, PITTSBURGH, PA.

Sales Offices • Warehouses

Located in principal cities and towns throughout Gulf's marketing territory





# A full Head of Steam

in **30** minutes or less with a

## Cleaver-Brooks Mobile Steam Boiler

### for pile-driving or extracting

Heavy-duty built to provide fast, dry steam — in dependable and ample supply — hot, dry steam that means less condensate at the hammer — smooth, powerful hammer action — steam that enables operators to drive more piling in less time — that cuts man hours on every job.

Self-contained and MOBILE — easily towed by truck or tractor from job to job — quickly moved from one location to another on the job. Haul it to the job (no crane needed to set it up) — hook up water and steam lines — start burner — and in 30 minutes or less you have a



good "head of steam" — ready for work.

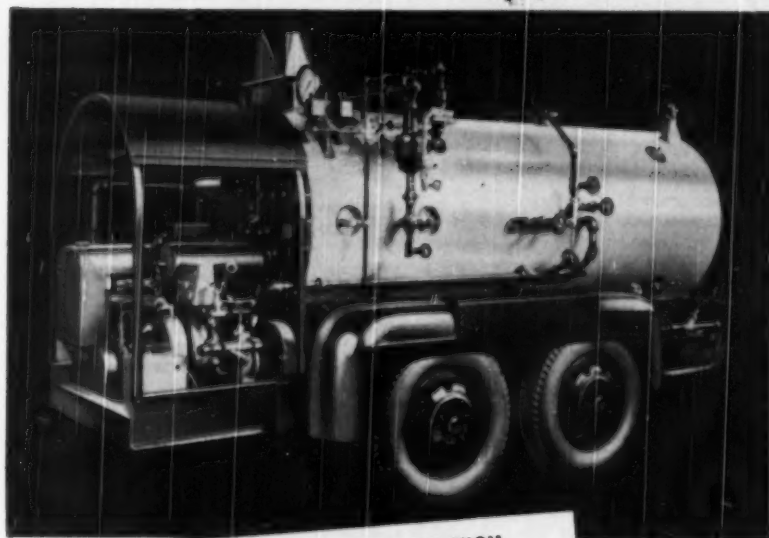
No need to bank fires at night — oil-fired — rapid starting — for an early start in the morning. Operates at 30% to 100% of rating without affecting its guaranteed efficiency of 80%.

All-year, all-season usefulness — besides pile-driving and extracting, use it for asphalt plant, ready-mix concrete plant, winter concrete operations and for thawing and miscellaneous heating. Write for bulletin.

**CLEAVER-BROOKS COMPANY**

326 E. Keefe Avenue

Milwaukee



... WITH THE FAMED FOUR-PASS HIGH  
EFFICIENCY DESIGN OF

**Cleaver-Brooks**  
STEAM BOILERS



SEND FOR bulletin  
"Modern Pile-Driving and  
Extracting with Cleaver-  
Brooks Mobile Steam Boilers"  
— provides complete data  
and specifications.



- Trailer mounted for easy towing.
- Skid mounted for installation on your truck or trailer.
- Fast Steaming.
- Low-fire start.
- Constant steam pressure through automatic low and high fire control.
- Electric ignition.
- Self-contained fuel tanks.
- All-weather protected.
- Factory finished and tested.
- Choice of gasoline or electric motor.
- Clean, smokeless operation.
- Boiler horsepower — 80-125.
- Capacity lbs. of steam per hour (212° F.) — 3760-4300.

**Whatever your construction job asks of a truck . . .**



## ***NEW* INTERNATIONAL TRUCKS** **ARE Heavy-Duty Engineered TO SAVE YOU MONEY**

Heavy-duty engineering for long truck life on tough truck jobs is yours now in every single new International Truck from 4,200 to 90,000 pounds GVW.

That's the same extra value engineering that has kept Internationals first in the sale of heavy-duty trucks for 18 straight years.

America's most cost-conscious, profit-minded truck users have preferred Internationals year after year for only one reason: heavy-duty engineering means that International Truck performance is longer life performance, lower operating and maintenance cost performance.

And now the same management, engineers, test experts, and production men who kept Internationals a tradition in the heavy-duty truck field have developed every new International Truck. No matter what size truck you use, there's a heavy-duty engineered International Truck that's right and ready for you!

### **You'll find new comfort in the new Comfo-Vision Cab**

Model for model, here is "the roomiest cab on the road." It gives you new comfort in easy-riding cushions, adjustable seats, controlled ventilation. It gives

you full front visibility through a one-piece, scientifically curved Sweepaigt windshield.

And comfort is right at your fingertips when you take the sturdy wheel. The entire steering system is engineered for more positive control from a more comfortable position.

### **You'll get an all-new truck proved under actual operating conditions**

"Proved under actual operating conditions" takes in years of time, millions of dollars, countless miles. But these new Internationals took in all those and then some—to give you proved-in-advance performance.

No matter what kinds of roads or loads, climate or conditions your trucks must meet, there's a new International that has been proved right for your requirements.

Find out all about that truck from your nearest International Truck Dealer or Branch, soon.

International Harvester Builts  
McCormick Farm Equipment and Farmall Tractors  
Motor Trucks . . . Industrial Power  
Refrigerators and Freezers



Tune in *James Melton* and "Harvest of Stars"  
NBC, Sunday afternoons

***ALL NEW, ALL PROVED***

# **INTERNATIONAL TRUCKS**

INTERNATIONAL HARVESTER COMPANY CHICAGO

## Four Good Reasons Why I'm Banking on BLUE BRUTES

**LARRY DEMAYO**  
Philadelphia  
Contractor

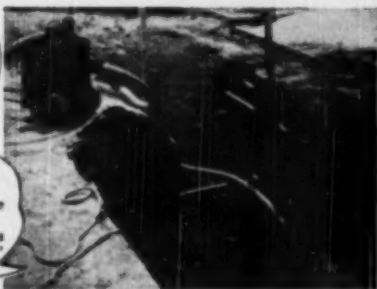


Larry DeMayo, an up-and-coming construction man, is getting his full share of important contracts in and around Philadelphia. He's also a steady customer for Blue Brutes. You'll know why when you

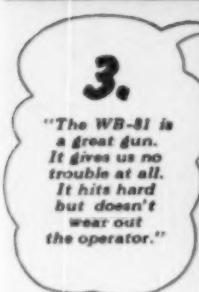
read the captions with these action-photos, taken on his drainage sewer job near Large and Rhawn Streets. And remember: these are not our claims... these are Mr. DeMayo's own words.



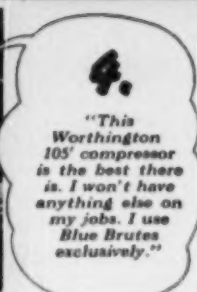
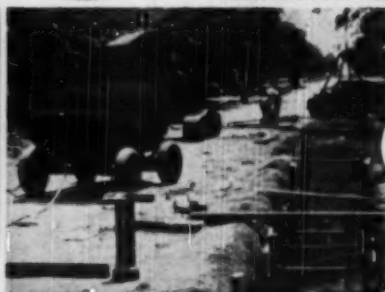
**1.** "The boys all want to run the Worthington spade. It turns out a lot of work without tiring them out."



**2.** "That pump (7M) really throws out the water. I'm going to get another one just like it. It's the best pump I've ever seen."



**3.** "The WB-81 is a great gun. It gives us no trouble at all. It hits hard but doesn't wear out the operator."



**4.** "This Worthington 105' compressor is the best there is. I won't have anything else on my jobs. I use Blue Brutes exclusively."

As far as we're concerned, that's the Blue Brute story. After all, job-testing is the only sure way to find out just how construction equipment will perform. And when a man who's using that equipment speaks up... it's time to listen!

We'd just like to add that Larry

DeMayo has plenty of company. All over the country Blue Brute users will tell you that for time-and-money-saving performance, quality materials and workmanship *there's more worth in Worthington...* Immediate deliveries from your nearby Worthington-Ransome Distributor.

See him for further facts, or write us direct.

Worthington Pump and Machinery Corp.  
Construction Equipment Department  
Horison, New Jersey  
Distributors In All Principal Cities

**WORTHINGTON**



# BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

# BRANDS

## *are important!*

Cattle are branded primarily to prove ownership.

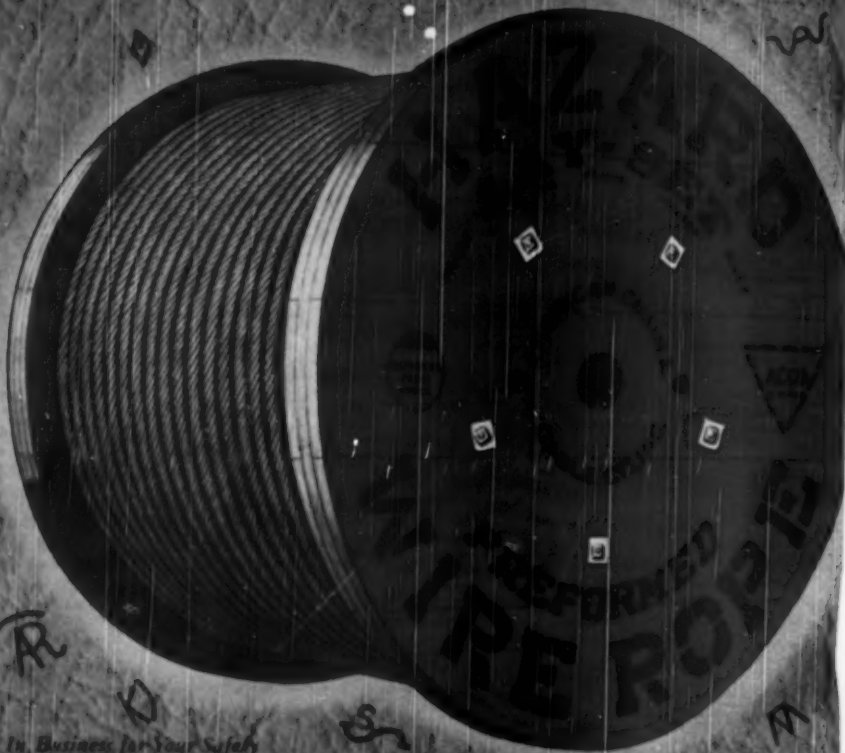
But, experienced cattlemen and livestock buyers know that some brands are always found on higher quality animals.

These brands come from better feed and water,

from better breeding stock, from better handling.

The HAZARD brand on a reel of wire rope is your assurance of quality—quality backed by wire rope manufacturing experience dating back to 1845. Next time specify HAZARD.

Remember—*"Brands are important!"*



ACCO

*In Business for Your Safety*

**AMERICAN CHAIN & CABLE**  
**HAZARD WIRE ROPE DIVISION**

Distributors: Pa., Atlantic, Canada, Mexico, London, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Birmingham, Conn.



# POWER

to mix a  
big windrow



## HEAVY-DUTY model

# AD-4

has everything  
you want in a  
Motor Grader

**POWERFUL** — 104 brake hp. . . famous General Motors 2-Cycle Diesel Engine . . . dependable, economical, instant-starting.

**HEAVY** — 22,140 lbs. effective weight . . . balanced for maximum traction and control.

**STRONG** — exclusive tubular frame . . . absorbs shocks, protects control rods inside frame.

**ACCURATE** — blade held firmly on road through direct down pressure . . . cuts smoothly, within fraction of inch of desired depth.

**HIGH CLEARANCE** — over 30" throat clearance for handling bigger windrows without interference.

## CONTROL

to provide  
a smooth finish



**TRAVEL SPEEDS** — smoothly synchronized with operator controls . . . all the needed power applied as required.

**"ROLL-AWAY" MOLDBOARD** — less power required to handle bigger windrows at faster speeds. Material is rolled, not pushed.

**FULL CIRCLE REVOLVING BLADE** — swings ahead of platform with plenty of end clearance.

**FULL RANGE OF BLADE POSITIONS** — plus leaning front wheels, for handling all types of grading with ease. Blade can be shifted, too, to a maximum of 40° right or left.

**ELECTRIC BRAKES** — Control positive, operate with less effort than auto brakes.

**PLUS . . . Easier Steering, Larger Clutch, Electric Gauges, Full Visibility and many other outstanding advantages.**

### OTHER

#### DIESEL-POWERED SIZES

Model AD-3 - 75 brake hp.; 21,825 lbs.

Model BD-3 - 75 brake hp.; 19,042 lbs.

Model BD-2 - 50.5 brake hp.; 17,773 lbs.

(Same Proved Design As AD-4)

#### GASOLINE-POWERED

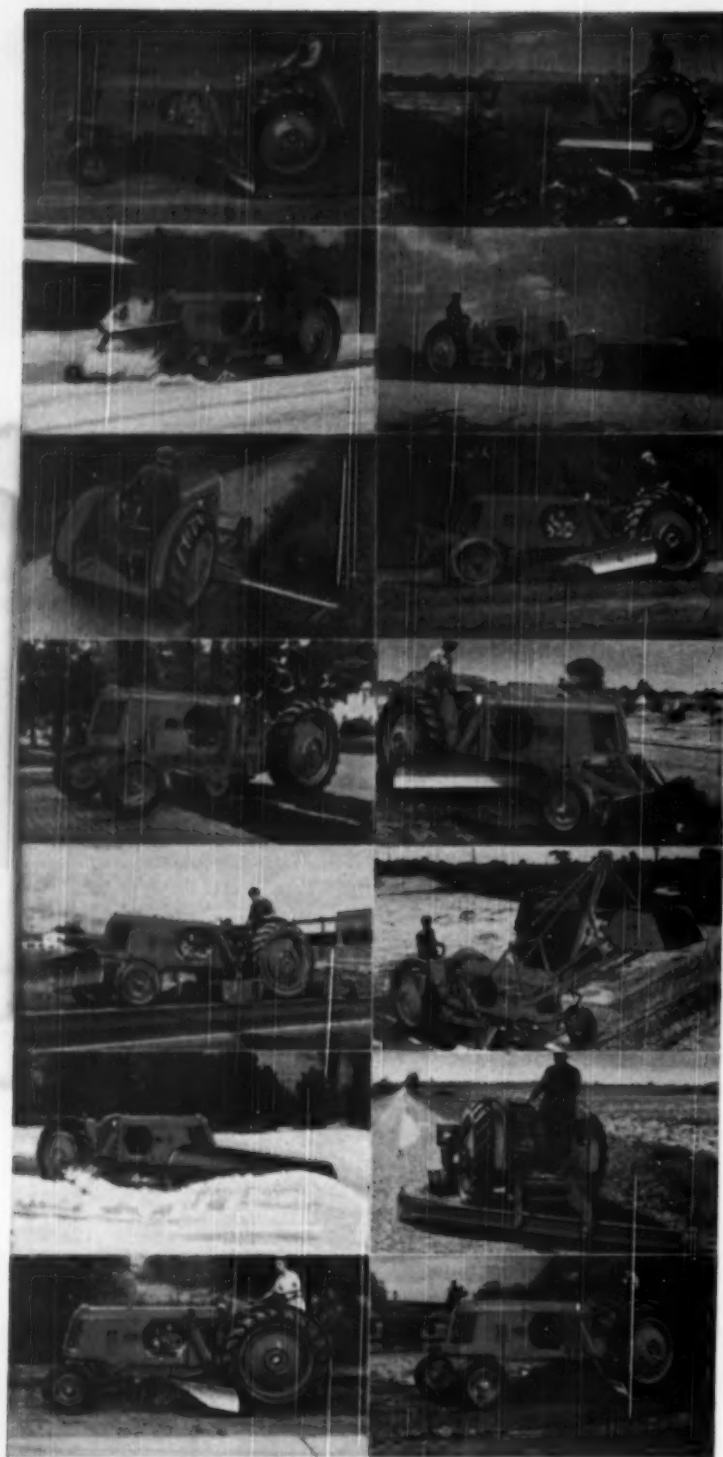
Low Cost Model D with TANDEN DRIVE

34.7 brake hp.; 8,560 lbs.

# ALLIS-CHALMERS

TRACTOR DIVISION





## Some of

### Does Many Jobs ... BIG JOBS

The HUBER Maintainer costs only ONE-THIRD the price of a big motor grader, yet it does ALL of your grader maintenance work.

It outperforms many machines that are larger, heavier, more costly, slower, more expensive to operate, more limited in use. For proof of these statements, see a demonstration.

The HUBER Maintainer is backed by a dozen years of experience in the field on federal, state, county, municipal, township, airport, cemetery, industrial and contract work.

It does all of grader maintenance work . . .

### PLUS

. . . these important jobs, with attachments:

- BERM LEVELING
- ROAD PLANING
- BULLDOZING
- LIFT LOADING
- SNOW PLOWING
- HIGHWAY MOWING
- BROOM WORK
- PATCH ROLLING

# HUBER

# the reasons **HUBER** gives you **MORE WORK** for your **MONEY!**

## **MANY FEATURES**

**42½ H. P.**—More power than many graders. More power, by far, than in ordinary maintainers. Plenty of reserve for the toughest jobs.

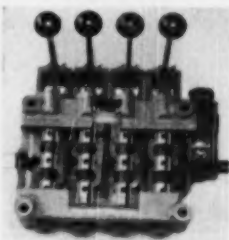
**OVER 6,000 LBS.**—The HUBER Maintainer weighs over 6000 lbs. with solution in the rear tires. Enough weight for most grader requirements . . . enough for all maintenance work.

**BLADE IS PUSHED**—Owners credit HUBER's blade-pushing design for a **THIRD MORE WORK** than conventional pulled blades would produce. Power is transmitted directly from the driving wheels to the moldboard.

**COMPARE** the HUBER with **ANY** grader or maintainer on the basis of horsepower, cost, proven dependability, versatility and long range economy.

## **HYDRAULIC CONTROLS**

These hydraulic valves control the raising, lowering and **ANGLING** of the blade and **ALL MOVEMENTS** of the versatile attachments. Conveniently grouped finger-tip controls are smooth operating and quick acting. Special steel tubing is used to convey oil to cylinders except at points where the flexibility of hose is required.



### *Makes Budgets Go Farther*

The HUBER Maintainer is easy on budgets, both in the initial cost and in operating costs. You can buy **TWO HUBER Maintain**ers and pay their operating expenses for a year for the price of one large motor grader.

There's a HUBER Distributor near you—Call him today or write to the factory.

**MFG. CO.**  
Marion, Ohio

Manufacturers of HUBER Maintain

ers and 3-Wheel Rollers and HUBER Graders

## *Some of the jobs **HUBER** Maintainers are doing*

**GOVERNMENTS**—Care of highways, secondary roads and lands in national parks, reservations, etc.

**STATES**—Many kinds of highway grading and maintenance work.

**COUNTIES**—Every-month care of highways and secondary roads.

**MUNICIPALITIES**—Street and alley grading and maintenance, care of parks, dumping grounds, etc.

**TOWNSHIPS**—The all-around grading and maintenance machine for township roads.

**PUBLIC GROUNDS**—Care of parks, playgrounds, conservation areas, public beaches, etc.

**OILFIELDS**—Grading and maintaining roads, building dams around oil wells and storage areas.

**CEMETERIES**—Every-month care of drives, mowing, developing new grounds, snow removal, patching, etc.

**AIRPORTS**—Grading unpaved areas, patching pavement, mowing, snow removal by plow or broom, towing, etc.

**LOGGING**—Grading and maintaining logging roads and grounds.

**INDUSTRIES**—Care of industrial roadways and grounds.

**MINES**—Care of roadways; sweeping coal veins before removal.

**ESTATES, RANCHES**—Care of roadways and grounds.

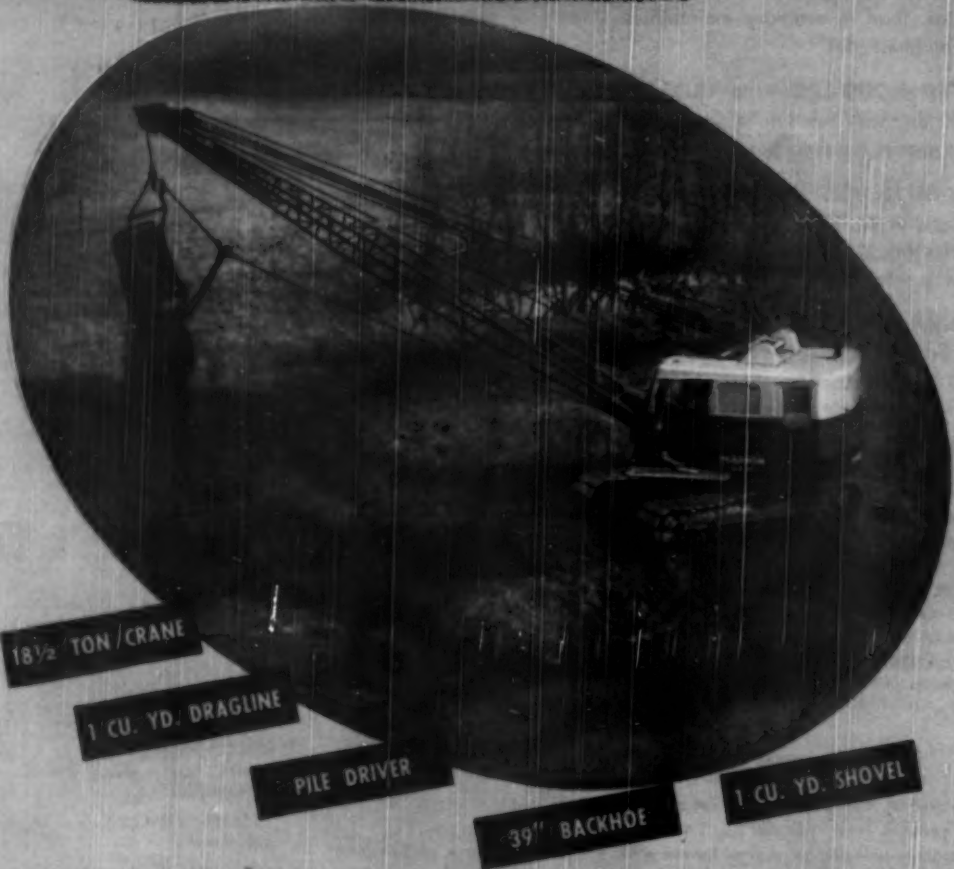
**RACE TRACKS**—Care of tracks and surrounding grounds.

**CONTRACTORS**—Performs many different jobs in all kinds of contract work.

ANNOUNCING THE

# MARION 43-M

AN ALL-PURPOSE 100 YD MACHINE



## MARION

POWER SHOVEL CO.  
MARION, OHIO, U.S.A.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES



from 100 cu. yd.  
to 40 cu. yd.

HERE

HERE

HERE

*Make more money*

- Save expensive lumber and carpentry labor
- Complete each job faster
- Use the same forms for a wide variety of work
- Use the forms over and over—they're built to last longer
- Get a better quality of finished work

## ...with **BLAW-KNOX** STEEL CURB AND GUTTER FORMS



WRITE FOR BULLETIN 2259 for complete information—28 pages of detailed illustrations show form set-ups for every type of work with complete instructions on how to use them. You'll find your job illustrated—you'll see how to make more money on every job.

HERE'S the fastest, most economical method of forming concrete curb, curb and gutter, integral curb or sidewalks you ever saw! One set of Blaw-Knox Steel Forms handles every job from simple straight work to serpentine or curved shapes, without the expensive carpentry that boosts man-hour costs and cuts profits. Easy to set and strip, they get the job finished on schedule and well within your estimate. You can use them repeatedly in combinations to fit every requirement. Costly hand finishing is eliminated and finished jobs have a smooth perfection impossible to achieve with wood forms. Form maintenance is practically non-existent.

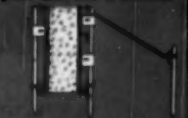
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## Bridge Pivoted into Position

Nevel economy design permits spanning of gorge without falsework or high lines

**By Wendell F. Pond**

Associate Bridge Engineer, California  
Division of Highways, Sacramento

**E**ARLY last year the State of California completed construction of a new type of bridge which was erected across a canyon 250 ft. wide and 145 ft. deep without the aid of falsework or high lines. By utilizing inclined bents pivoted at top and bottom it was possible to assemble each half of the bridge on each bank and then swing each half together to a junction near the center of the crossing. This new type of bridge is the result of an effort on the part of the state's engineers to devise a cheaper bridge than any of the conventional types which would ordinarily be used for a crossing of this type.

The bridge carries California's Redwood Highway across Rock Creek near its junction with the South Fork of the Eel River approximately 200 miles north of San Francisco. It replaces a temporary timber trestle which was erected as an emergency measure in 1937, when it was found that a then-existing timber arch was in danger of failure.

### Arch Too Costly

Shortly after the end of the war, plans and specifications were prepared and bids advertised for a reinforced concrete arch bridge. Based upon previous experience, the arch appeared to be the most economical type of structure. The rock slopes of the gorge would furnish good foundations for an arch, and the span length was well

within the economical range. When bids were opened in August of 1947, however, it became apparent that an arch was not the most satisfactory structure for the crossing. Only one bid was received, for an amount of \$161,015. This represented almost \$21 per sq. ft. of bridge and was far above the true value of the bridge. Rather than build a bridge at this high cost, the state's engineers decided to reject the bid and to make further studies relative to working out a cheaper type of bridge.

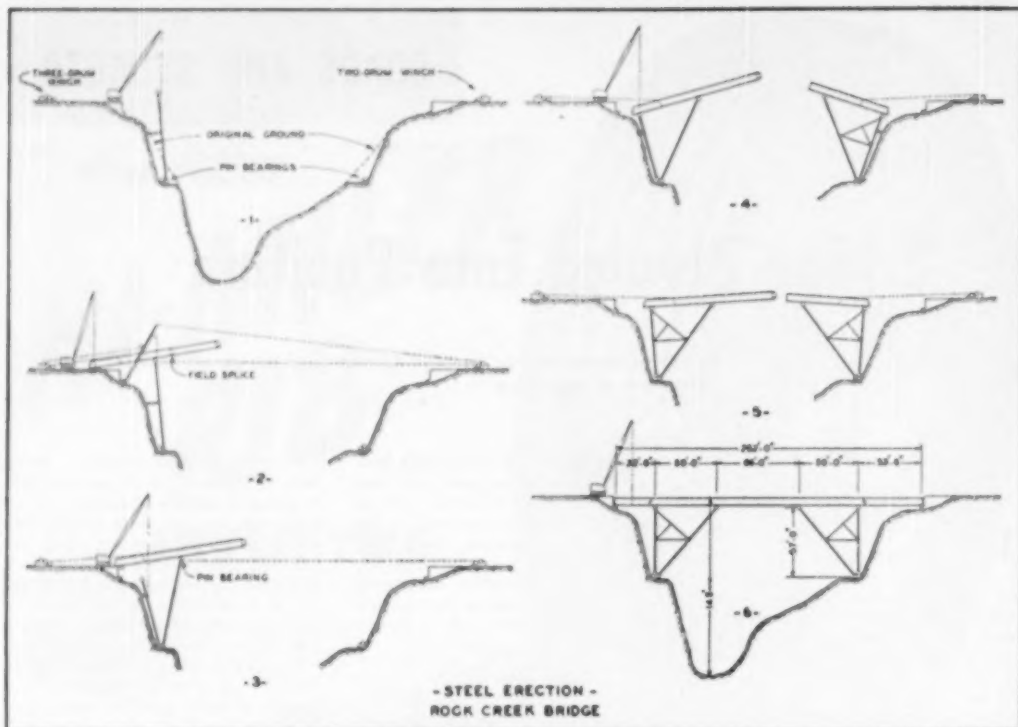
The excessive price of the reinforced concrete arch was attributed to the high cost of labor and lumber for falsework, and to the additional cost of rigging a high line. The problem then resolved itself into developing a



★ (Left): Stage of erection procedure corresponding with Step 2 in drawing. Girders, which had previously been field spliced, are being placed on inclined bents using an A-frame

★ The two halves of the bridge were allowed to swing together. The crane shown on the existing bridge (far left) was used to swing steel workers out to place erection pins in center splice. Note hinged splice plates at near ends of far girders





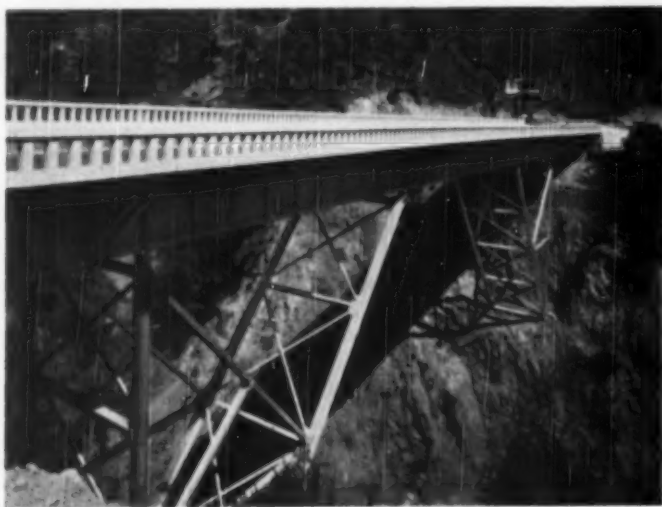
★ Sequence of steel erection procedure (somewhat simplified—see text)

new type of structure that would reduce or even eliminate the cost of these expensive construction procedures. Any of the other types of concrete bridges would have required the erection of falsework. A steel arch

would have necessitated the use of a high line. A conventional truss or girder would have required either high expensive piers, extensive falsework or some type of counterweight to permit cantilever erection.

The present bridge was finally evolved and advertised for bidding, and the results of these bids more than justified the extra time spent on design. Eight contractors submitted bids on January 7, 1948, and the contract was awarded to the low bidder for \$108,890. This was \$42,125 less than the bid for the arch and represented a saving of 32%. This saving becomes even more significant when it is realized that there was a rapid increase in construction costs during the five months between the two advertising dates.

The new bridge is essentially a continuous-deck plate girder supported by steel bents. The two girders are 6'-0" deep and are spaced at 18'-6" on centers. The bridge is 252 ft. long with five spans of 32'-6", 50', 66', 50' and 53'-6". The three central spans are continuous, but the two end spans are hinged. Bents are composed of wide-flange columns under each girder with T-beam and wide-flange bracing. All columns have pinned bearings at top and bottom. These bearings were required for the proposed method of steel erection (as described below) and also served to eliminate bending stresses in the relatively long and slender columns. The bridge deck, a reinforced concrete slab 10 in. thick,



★ The Rock Creek Bridge seen shortly after completion. Length between end bearings, 252 ft.

gives a roadway width of 26'-0" between concrete curbs.

### Construction Procedure

The erection of steel was preceded by stripping of the rock slopes of the creek to form benches for column footings. The concrete abutments were constructed and all lower column bearings were then placed in position and carefully adjusted to line and grade. Winches were set up on the ground back of each abutment and anchored by means of I-beam dead men. The accompanying drawings illustrate the various steps in the erection of the remainder of the bridge. Descriptions of each of the six steps of erection are outlined below:

1. The inclined bents were assembled on the ground back of the abutments, lowered to their bearings and temporarily braced against the bank with timber struts. The inclined bents, being relatively heavy, were assembled into an upper and lower half with the two halves being lowered separately.

2. Girders were field-spliced on the ground and were then placed on the inclined bents. The girders for the left half were too heavy to be lifted safely with the truck crane that the contractor had on the job, so an A-frame was rigged from young fir trees. The crane, however, was useful in steadying the girders as they were being moved forward by the A-frame. The girders for the right half were fairly light and were set entirely with the truck crane.

3. Cross bracing was temporarily bolted in place between the girders, and the girders were pulled forward to the position shown. The vertical bents were then completely assembled, lowered to their bearings and braced against the bank.

4. The girders were lowered on the vertical bents. Bracing was placed between the vertical and inclined bents when the two halves of the bridge were in this position. The bracing could only be fastened loosely because of the relative movement that took place between the bents as the bridge was swung together.

### Bridge Swung Together

5. The two halves of the bridge were then swung slowly together until a connection was made. Additional cables (not shown) were run from each winch to the opposite half of the bridge and were used to pull the two halves out beyond their balance points.

The contractor had previously fastened the web splice plates to the girder webs by tack-welding steel hinges to them, and when the two halves came together it was a simple matter to swing the splice plates into

position and secure them with erection pins and bolts.

6. The girders and cross bracing for the end spans were then placed in position, and the structure was ready for final riveting.

The roadway is on a curved alignment for the full length of the bridge. The radius of this curve is 1350 ft. and superelevation is 8%. The curved alignment caused but little complication in design or erection. The girders of the three central spans are parallel to a tangent at the center of the 66 ft. span, and the abutment ends of the end girders are approximately centered under the deck.

### Repeated Use Planned

The engineers of the California Division of Highways are quite pleased with the success of this unique method of bridge erection and will undoubtedly use similar types in the future when it becomes necessary to span deep, relatively narrow gorges. The maximum length of such a bridge is, of course, limited by the load capacities of readily available cranes. It is evident, however, that the rental cost of even a large, expensive crane for the few days required to place girders would be but a fraction of the cost of erecting falsework to a height of 150 ft. or so.

The Rock Creek Bridge was designed by the Bridge Department of the California Division of Highways. H. W. Ruby of Sacramento, California, was the general contractor, and J. D. O'Brien of Stockton, California, subcontracted the erection of steel. The writer served as resident engineer for the Division of Highways.

### Arterial Highways in Urban Areas

The increasing attention to the planning and design of urban arterial highways during the past few years, has emphasized the absence of modern engineering textbooks and design standards in this field. Recognizing this need, the AASHO Committee on Planning and Design Policies undertook the preparation of a "policy" on the subject. Work thus far has resulted in its tentative approval of 4 chapters of an ultimate policy of about 12 chapters. While the committee is proceeding as rapidly as possible on other chapters, it is recognized that it will require considerable time to draft all chapters of the preliminary discussion and even longer to draft the conclusions necessary for converting the preliminary discussion to a policy, and for the association to adopt and print the complete policy.

The committee concluded that the 4 chapters now nearly complete should be made available in a limited distribution form until the whole can be completed.

According to H. E. Hilts, deputy commissioner, Public Roads Administration, who is chairman of the AASHO committee, these 4 chapters seem particularly appropriate for early distribution, since they treat "at-grade" types of highways now being considered in nearly all urban areas and for which few design practices and standards have been developed. This pamphlet is titled "A Preliminary Discussion on Arterial Highways in Urban Areas, Part I," February, 1950.

As a product of an association committee all available copies have been forwarded directly to the state highway departments. Some of the departments are reportedly making copies to supply their field engineers.

To the extent possible under these conditions, the committee requests review of this material by urban engineers and will welcome comments and suggestions to be considered as the whole of the "policy" is completed. This material is only tentatively approved and has not been adopted as an AASHO policy.

### Nan Powers Is Dead

It is our sorrowful duty to announce the death of a valued and much liked member of the Gillette organization.

Mrs. Nan S. Powers, for the past 15 years publisher of *POWERS' ROAD AND STREET CATALOG*, died suddenly April 3 in Banning, California of heart failure. She became associated with the Gillette Publishing Company in 1934 and since that time has been in charge of the Catalog that bears her name.

Only in January of this year Mrs. Powers transferred her residence to California in order to take life a little easier. She had planned to come East once or twice a year to keep in touch with her many friends in the highway field and maintain her identity with the Catalog to which she gave so many active years of her life.

She was the widow of E. L. Powers, founder and publisher of *Good Roads Magazine*. Mr. Powers was one of the charter members of the American Road Builders' Association and for many years was its secretary.

She is survived by a daughter, Mrs. Peggy Powers Lyon and a granddaughter, Nancy, of Midway, Tennessee, a brother in Lancaster, Pennsylvania and a sister in Banning.

## ★ We Need Strong State Highway Departments

Whatever the nature of new Federal-aid highway legislation, now beginning to be worked out in Washington, the big need is for strong state highway departments. Huge sums are being invested through state highway departments, and these sums are likely to be increased in coming years, in the interest of a business and farming economy now geared to the car and truck.

### All Must Cooperate

All who are interested in better highways can well take note of several points outlined at the San Francisco AGC meeting by D. C. Greer of Texas, president of the American Association of State Highway Officials. Mr. Greer, whose words have force because of his own state's outstanding highway department, urged contractors as community leaders to "lend aid and assistance to your state highway departments in their efforts to improve their administrations of highway matters at the state level."

In addressing the contractors he was also, in effect, talking to all influential citizens including state legislative leaders. State legislatures will more readily entrust large sums of public funds to a highway organization set up and manned and legally empowered to give outstanding value for the dollar. Lawmakers, on the other hand, would rightfully hesitate to vote new revenues where the state highway department is weak and ineffectual, as some still remain today.

State laws controlling the boards of commissioners, which establish the policies for many state highway departments, should be streamlined and strengthened and removed as far as possible from politics, urged Mr. Greer. This is in order that proper men may be induced to accept these posts of responsibility and may be permitted to carry out the administration of their department in a manner that will provide expeditious, efficient and economical utilization of available funds.

Secondly, noted Mr. Greer, if "you would take time to examine the financial structure of the state highway department in your particular state, you might find that certain leaks in its financing still prevail, in spite of vast improvements in most states."

Some states still divert highway user revenues to non-highway purposes. This should be stopped at the earliest opportunity by constitutional amendment, as has been done already in a majority of the states.

### Other "Leaks"

In other states an even more serious leak lies in excessive or unsound dispersion of road funds to too many purposes, leaving too little money for main tasks. More of the total road revenues may need to be concentrated on the state highway system; state roads are "farm to market" routes as well as the backbone roads knitting the state's communities together.

The refund system on gasoline tax is badly abused in still other states, and this serious leak in roadbuilding funds could be eliminated by rigid enforcement, with vast benefit to the traveling public.

Trucks in many states are not being required to pay into the road funds anywhere near the fees specified by law—still another leak, not to mention the need to tax heavy vehicles more equitably in proportion to the wear and tear they are causing. The laws in some states provide that trucks shall pay license fees commensurate with the loads expected to be carried. It may be that, due to lack of adequate policing or a weak registration system, trucks are not being required to pay legally specified fees. This may represent a substantial sum.

### Like "Leaky Barrel"

In state after state, in other words, the fiscal policy is like a leaky barrel, and who wants to pour new tax money into such a receptacle?

It is encouraging to realize that in a growing list of states serious studies are afoot, or already completed, aimed at putting the state highway legislative house in order. Legislative interim committees in some instances are making exhaustive studies of highway needs and the revenue problem.

Meantime the owners of 43 million cars, trucks and buses are bouncing along over our fast disintegrating road network, while engineers are trying to figure out how to perform betterments with *less than half* the necessary construction funds, taken as a national average.

The first need is for a strong highway department with laws giving it the green light. Potentially our best friend—and also the public's—is the state legislative member. He holds the key, and will need all the expert counsel and factual data we as highway engineers and contractors can give him.

**IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS**



## ★ Another Case of Design Resourcefulness

The editors of *ROADS AND STREETS* take more than ordinary pleasure in presenting the article in this issue by Wendell F. Pond of the California Highway Division bridge staff.

When bridge designers sharpen their wits and cut the cost of a project 32% by redesigning—as was done here—it shouldn't be news but it is news.

There should be more instances of this kind.

Bridge projects always afford opportunity for potential savings in methods of construction and the contractors as well as the engineers should be given all possible freedom in thinking out economical field procedures. This job readily shows how the

ingenuity of a wide awake engineer saves the highway department funds. It also indicates that there are hundreds of other small details, not large enough in themselves individually to merit printed discussion, but which grouped together more than justify the retention of engineering talent.

## ★ Charley Upham

Roadbuilding could do with more men of the stature of Charles M. Upham, whose retirement to a consulting basis from the American Road Builders' Association was announced at the ARBA Cincinnati convention.

Mr. Upham has been the Association's dominant figure for twenty-four years. His retirement, at age 64, certainly should not end his usefulness to the highway cause. His friends and well-wishers everywhere join with us in hoping that he will continue to

lend counsel on highway problems and legislative needs.

The organization built by Upham and many others—the ARBA—never had a bigger job to do than it has today. ARBA's uniqueness lies in its ability to weld together all the diverse groups of engineers, contractors, government leaders and equipment men into something approaching a solid front for industry advancement. The show will go on.

There is a "help wanted" sign out

for more big-thinking administrators whose judgments on highway matters are rooted soundly in up-from-the-bottom technical experience. Mr. Upham's influence has been chiefly along national lines. The need we refer to here lies mainly in the state highway departments, which should continue to be the chief roadbuilding agencies in the administration of the federal aid program and in unifying highway development at all levels.

## New Soil Stabilization Method Developed Using Calcium Acrylate

**A**n ocean beach, a soupy mud road, or a muddy pasture can be turned into a stable, rubbery surface suitable for landing operations, movement of heavy vehicles and landing of aircraft in less than five hours.

This conclusion comes from a committee of civil and chemical engineers at the Massachusetts Institute of Technology, Cambridge, Mass. It is based on a study of a new chemical process for the stabilization of soils, sponsored at MIT by the Engineer Research and Development Laboratories, Fort Belvoir, Virginia.

The stabilization process is based on calcium acrylate, an organic chemical which is absorbed by the soil particles. Two other compounds, sodium thiosulfate and ammonium persulfate, are also used, which cause the calcium acrylate molecules to lock themselves together. Thus the soil particles are joined as the "innocent bystanders" in a simple, fast chemical reaction.

The treatment is based on an entirely new approach to soil solidification, notes the report. It can be used even on soils which contain as much as 30% water by weight. The result, after a few hours, is a soil material of rubber-like consistency "well adapted to withstand heavy impact loads and to distribute static loads over an uneven foundation."

The binding action begins two minutes or less after the mixing has taken place, and five hours after treatment the soil is an elastic mass with tensile strengths from 5 to 10 psi.

### Very Hard When Dry

If the stabilized soil is allowed to dry in air for a week or more, says the report, tensile strengths of 500 psi, or even more are obtained—but this gain in strength is accompanied by a loss in elasticity. The soil becomes much harder. Rewetting of the dried soil causes a return of the material to its original rubber-like consistency, and its tensile strength returns to that achieved 5 hours after the treatment had originally been carried out.

In the recent MIT tests, a stabilized soil block 3 in. thick withstood the weight of a car moving over it 24 hours after treatment without noticeable indentation. A 16 lb. steel ball dropped onto the test section from a height of 7 ft. rebounded about 6 in. without causing any damage to the section.

In commenting on this development, T. William Lambe of the MIT staff said, "Although our preliminary tests are most encouraging, we consider our work to be still in the fundamental research stages. There are several major development problems which

must be overcome before this treatment will be a feasible one for general peace-time application. Among these problems are those of application of the chemicals to the soil and production problems of the chemicals in order to reduce their present high price. Also we have not made long duration tests and, therefore, have no information as to the performance of our product for long periods of time.

"However major these problems are, we feel that continued research may surmount them. We plan to continue our development work as well as search for other chemicals which may be even superior to the calcium acrylate."

The results so far achieved have already offered proof of the value of close cooperation between civil engineers, chemical engineers and colloid chemists in the field of soil solidification.

John B. Wilbur, head of the civil engineering department at MIT, is administrative head of the project. Committee members have included Dr. Harold C. Weber, professor of chemical engineering, chairman of the committee; Dr. Ernst A. Hausser, professor of chemical engineering, in charge of all chemical work on the project; Dr. T. William Lambe, assistant professor of soil mechanics and executive officer of the project; Donald W. Taylor, associate professor of soil mechanics; Alexander J. Bone, associate professor of highway and airport engineering; and Dr. Francis E. Vinal, assistant professor of ceramics.





★ Back view of machine shows 10-ft. wide strip of concrete road being placed



★ Close-up of hopper shows 2 of the 3 vibrators and generator cable

# One-Man Paver

## Developed for Placing Concrete Without Forms

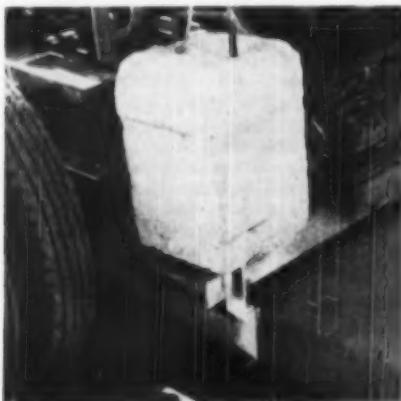
Roadbuilders in middle-west are observing results of new machine, which uses ready-mixed concrete; places 10 ft. lane at 10 lin. ft. per minute. Careful slump control and use of vibration are factors

**H**AVE you ever wondered if the day would come when one man and one machine could build a concrete road? Many roadbuilders have, of course. Now, the Iowa State Highway Commission is doing something about it. Over a period of two years

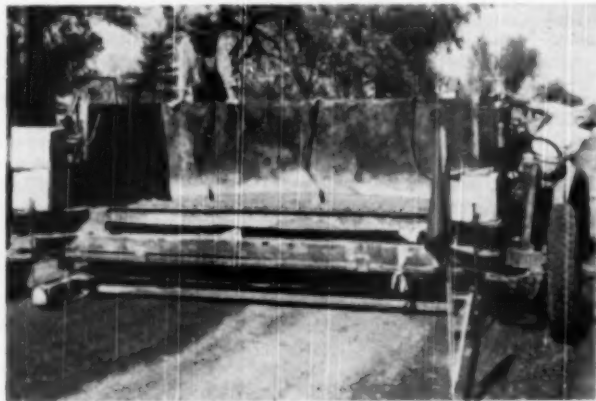
of "spare time" activity, J. W. Johnson, laboratory chief, and other engineers of the Iowa Highway Commission developed what they call a "placing and finishing machine." The three-in-one machine combines the operations normally performed by a spreader, transverse finishing machine and longitudinal float. The usual hand finishing operations are eliminated.

One man operates this new machine, which leaves a 10-ft.-wide rib-

bon of 6-in. unreinforced concrete behind it. Using no fixed forms, the self-propelled machine will move ahead at a rate of speed up to 10 ft. per minute if material is ready. Sled-like runners on the sides of the new paver act as forms, and are inclined slightly. The key to the entire operation is in vibrating the concrete. The vibrators, powered by a generator, consist of three motors with eccentric weights.



★ Inclined runners take place of fixed forms. Picture taken as machine progressed



★ Front view of the placing and finishing machine in operation near Mason City, Iowa

★ Trunk from truck mixer fills the hopper with concrete. Notice operator of machine at right

★ Appearance of one lane shortly after machine deposited its trail of 6-in. thick concrete. The white curing compound has already been applied along the edges

★ Finished pavement, sprayed with white curing compound. The 4-in. space between the two lanes is filled in later with a bituminous mixture. Tire marks on the right lane are from the paver, which rides along the finished lane when placing the second lane

After one lane of a road has been placed, the machine is maneuvered into position to pave the second lane. There is a 4-in. space between lanes which is later filled with a bituminous mixture.

This innovation in concrete-placing is only in the preliminary stage of development. Three experimental runs were first made at Ames. Later, a 0.5-mile road project in O'Brien County was paved with the new machine. Photographs accompanying this article show construction at Mason City, Iowa, where a one-mile rural road project was built. As in all projects employing the machine, ready-mix concrete was used.

According to those who have studied the operation of the new machine, it is entirely practical to build a 22-ft.-wide or wider pavement at a single pass, and to modify the machine to permit the installation of almost any system of reinforcement of the concrete slab that might be desired. Such modifications have been deferred until the present machine can be studied on a full-scale operating basis.

Though it is granted that the machine is only in the experimental or development stage, this futuristic paver hints of things to come in concrete-roadbuilding, especially in the secondary road field.

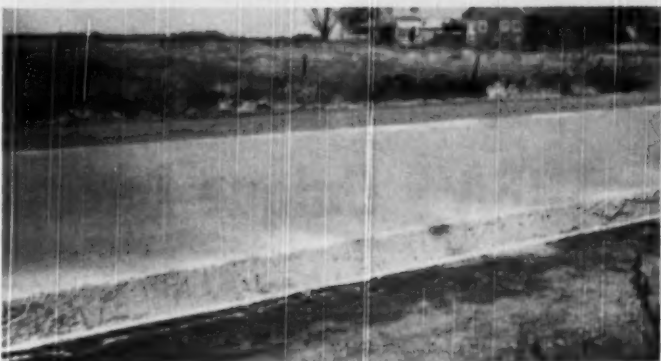
The Blaw-Knox Company has taken over this machine for development, manufacture and marketing.

### L. I. Hewes Passes

Dr. Laurence Halsey Hewes, Chief of the Western Regional Office of the Bureau of Public Roads, died suddenly in San Francisco on March 2. He was 74 years old.

In 1911 he was employed by the Bureau of Public Roads, at a time when the science of roadbuilding was in its infancy and the needs for modern highways were first being felt. From the beginning, Dr. Hewes has played an important part in highway development, not only in the discharge of assignments of great responsibility, but as an original thinker in the uncharted fields through which highway development has advanced.

He became Chief of Economics and



L. I. Hewes

Maintenance, and was shortly recognized as an authority on highway financing. He was the first to apply systematic procedures in measuring the economic need for highways. With the initiation of Federal aid in 1916, Dr. Hewes took an important part in planning the organization's administration and working with the States.

Since 1920 he has been in charge of Federal-aid and National forest road construction in 11 western states, Alaska, and Hawaii. In that capacity he exercised great influence in a large region, and became recognized as an authority on all phases of highway development.



★ Charles M. Upham—retires from position as ARBA engineer-manager to consulting role



★ E. R. Needles, consulting engineer, re-elected president of ARBA for 1950



★ Jennings Randolph, continues as ARBA treasurer and president of Association's airport division

## ARBA'S Unique Importance

### to Roadbuilding Again Demonstrated at Cincinnati

**Retirement of Charles M. Upham at American Road Builders' Convention was occasion for review of Association's vital place in highway field. Meeting again brought contractors, engineers, government officials and equipment men together to discuss technical problems and highway legislative needs**

**T**HE retirement of Charles M. Upham as engineer-director of ARBA was, of course, the chief immediate news at the American Road Builders' Association 47th annual convention. This meeting, held at Cincinnati, March 6-9, drew an estimated thousand delegates and visitors. Upham's retirement on a consulting basis was announced at the convention's close by president re-elect Enoch R. Needles, who took over the helm pending ARBA board action on Mr. Upham's permanent successor.

(For comment on Mr. Upham's long and unique service to roadbuilding, see editorial in this issue.)

President Needles in his annual address took a militant forward look, foreseeing that the Association is on the threshold of new growth and solidarity. He traced the present strength of the various divisions, which include the manufacturers, contractors, county, municipal, air-

port, educational, Pan American and the 50 technical committees.

A forceful and eloquent statement of highway needs spearheaded the convention program. The need for stepping up federal participation . . . The importance of bold, aggressive campaigning for better highway support in the various states . . . These facts were urged by President E. R. Needles, who stated the case for faster overhauling of the nation's obsolescent road system. He urged that the need be drummed into the public's ears over and over.

Plenty of contractor capacity and equipment is waiting, ready to be given a bigger road program, noted President Needles, who cited Maine's \$20,000,000 completed toll road and New Jersey's \$200,000,000 toll turnpike just getting under construction as examples of the expediting that can be done by bond financing where necessary.

Technical sessions were unusually well attended, the papers and discussions excellent. Particular praise is due chairman Earl F. Bennett and his committee on soil compaction for a lively all-morning discussion in which equipment men, contractors and engineers swapped viewpoints; to Harold F. Clemmer, chairman of the ARBA-Highway Research Board joint committee on construction equipment, for a constructive session; and to moderator A. T. Goldbeck and panelmen for the symposium on concrete pavements; and to all who took part in the panel discussion on local roads.

#### National Legislation

The Association's usefulness in bringing engineers, contractors, equipment men and legislators together was stressed by Mr. Upham in his opening session message.

Prominent on the program was discussion of national highway problems, particularly legislative needs. Hon. William N. Whittington, chairman, committee on public works, U.S. House of Representatives, traced the part played by roads in the nation's growth. He presented a highly documented outline of the national need

for new highways, indicating that this legislative leader for one is fully aware of the gravity of the road problem. As "next steps" he urged: **€** Expanded federal-aid with 75% federal participation for Interstate System construction. **€** Special fund increase for 4-lane roads, with controlled access extending for ten miles from large urban centers. **€** Federal assistance on the financial and administrative problems of local roads. **€** Faster progress in urban arterials. **€** Rewriting of antiquated right-of-way laws now impeding roadbuilders.

Another leader to voice national awareness of the road problem was Hon. Dennis Chavez, chairman, U.S. Senate committee on public works. He particularly champions the local communities. D. C. Greer, state highway engineer of Texas and president of AASHO, told of the importance of making fullest engineering data available to congressional committeemen as a guide in shaping federal-aid legislation. He outlined the AASHO's policy of advocating \$810 million annual federal highway aid. Greer warned that congress cannot be "high pressured" but will make a wise decision when it gets ready after weighing all the facts.

#### Billion Annual Aid

At the close of the convention the ARBA resolutions committee endorsed the principles embodied in the AASHO recommendation, except that annual aid of \$1,000 million was urged, as a minimum amount necessary for roadbuilders to catch up with the job.

Continuing on the broad theme, Wilfred Owen of The Brookings Institution, spoke on "The Outlook for Highway Transportation". He traced the continuing rapid rise in motor vehicle registration and traffic volume, and reiterated that expenditure of more funds on bettering the highways

(now at 3 billions annually for construction and maintenance) will be more than repaid in lowered over-all highway transportation costs (now 30 billions a year). He reminded us that half the present 3 billion annual outlay for roads goes to administer, maintain and pay debt service on existing roads.

"Continuing growth in automotive transportation will create highway deterioration of some 14 billions over the next ten years," noted Owen, who explained that this sum must be added to the \$41 billion estimated present backlog of road improvement. Thus we are faced with a "dead heat" of \$1.4 billions annually in deficiencies vs. new construction, leaving the \$41 billion backlog still with us in 1960, unless we step up our pace.

At the present rate that federal-aid is being assigned to construction on the Interstate System, it will take 100 years to "complete" this system, noted Owen. This speaker recommended numerous policy reforms and major legislative overhauling within the states, to provide for access control and other forward steps which will insure better utilization of both existing and new facilities.

#### "Pay as You Go"

On the subject of highway financing, Owen noted that if we were to attempt to raise an additional 4 billions of road funds by taxes on gasoline alone, it would be necessary to have tax rates 2½ times the existing rates, or to about 15 cents per gallon on the average. Rather it would be better to explore other means of raising funds, including elimination of demands which now waste funds. For example, over 400,000 miles of local roads have been declared non-essential by BPR and could be closed. Some urban street mileage also should possibly be eliminated from the highway systems. Right-of-way might be

developed or leased under public ownership to raise revenue from roadside concessionaires, as is done at airport terminals today.

A renewed study of the possibility of bonds is also suggested by Owen, who noted that bonds are the real "Pay as you go" funds, whereas gasoline taxes represent "pay now and build later."

And finally, Owen dropped a refreshing idea into the basket by suggesting a national "board of directors" for highway transportation, representing the automotive, rubber and petroleum and highway industries.

Public Roads Commissioner MacDonald was represented by a paper on the federal-aid program delivered in his absence by Larry Tuttle, MacDonald's assistant. This summary emphasized that despite seeming slowness in some quarters the 5-year record of roadbuilding since the war has been a remarkable accomplishment; in all 62,000 miles of federal-aid projects have been completed at a cost of more than 2,000 million dollars. Last year's program alone included 45,000 miles of projects under contract.

Commissioner MacDonald urged all to realize that a minimum of 4 billions annually is needed for a 15-year period to modernize our highway system, this sum representing 2½ billion dollars annually for construction alone, as compared with 1.2 billion reached in the peak post-war year of 1949 (these figures are for federal-aid projects, and do not include 100% state or local projects).

The importance of the time element was again stressed by the Commissioner, whose paper noted that careful and sound engineering takes time, and that haste will inevitably produce "slap-dash" plans. There is a serious and increasing lag in the advance planning and survey work among the state highway departments. On August 1 last year over 365 millions in projects were tied up in the "Programmed" stage, some jobs having been frozen there for four years, and half this sum for 16 months or longer. Public Roads is proposing the separate programming of surveys and plans (generally termed "Preliminary engineering") and right-of-way acquisition as the initial step in the programming procedure. Thus, only funds needed for this step need be taken up for one year's apportionment, while construction funds programmed for the second step could come from the following year's apportionment.

Today, on the eve of new federal-aid highway legislation, one of the



★ Aviation leaders at ARBA: Jennings Randolph, ARBA treasurer and Airport Division president, and assistant to president, Capital Airlines, Inc., Washington, D.C.; Phillips Moore, director, C.A.A. office of airports; Jack Bolton, manager of Port Columbus, Columbus, Ohio; and back row Walter Mac-

atee, highway transportation specialist, C.A.A. and former manager of the ARBA airport division; Everett D. Crites, deputy chief, engineering division, C.A.A. office of airports; and Rufus Phillips, president, Airways Engineering Corp., Washington, D.C.



## Needles Again Heads Road Builders

Officers and directors elected to serve ARBA in 1960 are as follows:

**President:** (Re-elected) E. R. Needles, of consulting firm of Howard, Needles, Tammen & Bergendoff, New York.

**Vice Presidents:** Paul B. Reinhold, president of Atlas Equipment Co., Pittsburgh, Pa.; Charles W. Smith, president, Smith Engineering & Construction Co., Pensacola, Fla.; W. A. Roberts, executive vice-president, Allie Chalmers Co., tractor division, Milwaukee, Wis.; T. E. Stanton, materials and research engineer, California division of highways, Sacramento.

**Treasurer:** Jennings Randolph, assistant to the president, Capital Airlines, Washington, D. C.

**Directors:** James C. Alban, President, Alban Tractor Co., Baltimore, Md.; James A. Anderson, commissioner, Virginia department of highways, Richmond; Jos. D. Bonness, pres., Jos. D. Bonness, Inc., Milwaukee, Wis.; J. F. Cast, sales department, Firestone Tire & Rubber Co., Akron, O.; H. G. Sours, Baldwin & Sours, Columbus, Ohio; Gail E. Spain, vice-president, Caterpillar Tractor Co., Peoria, Ill.

**Contractors' Division:** President, Nello L. Teer Jr., Nello L. Teer Co., Durham, N. C.; vice-president, Joseph D. Bonness, Jos. D. Bonness, Inc., Milwaukee;

**Directors:** Paul L. Andrews, Georgia Highway Contractors Association, Atlanta; W. C. M. Butler, Stripping and Construction Co., Hazleton, Pa.; C. J. Carroll, Michigan Road Builders Ass'n., Lansing, Mich.; G. C. Crowell, Tennessee Road Builders Ass'n., Nashville, Tenn.; Alan M. Thompson, New England Road Builders Ass'n., Boston; John A. Long, Florida Road Builders Ass'n., Tallahassee, Fla.; Mary K. Nierling, W. H. Noel Co., Jamestown, N. D.; Taylor G. Soper, Illinois Road Builders Ass'n., Chicago; Wyatt B. Hodges, R. H. Wright and Son, Inc., Ft. Lauderdale, Fla.; Rudolph Kraemer, Edward Kraemer and Sons, Plain, Wis.; Austin E. Page, the Lane Construction Corp., Meriden, Conn.; R. B. Potashnick, Cape Girardeau, Mo.; H. W. Riebe, with Charles Riebe, Lansford, Pa.; E. D. Sloan, Sloan Construction Co., Greenville, S. C.; and Herbert M. Warren, Warren Brothers Roads Co., Birmingham, Ala.

"hottest" subjects is that of local roads and how best to help improve them at a faster rate. An all-morning session in a crowded room was devoted to a panel discussion of this complex and controversial question.

Held by the County Highway Officials' Division of ARBA, with A. J. Thelan of Wisconsin as moderator, the meeting was devoted to an analysis of the contents of the bulky and ably compiled "Report of the Local Rural Road Problem". This document [see Mar. '60 **ROADS AND STREETS**] was prepared by a board of consultants at Senate request and submitted by Public Roads to the U.S. Senate subcommittee on roads.

Among the many facts and ideas coming out of this discussion, the following are briefly noted: **¶** Sentiment is growing to extend federal aid over a larger mileage of local roads than represented by the present secondary federal-aid system. **¶** Engineers and administrators strongly favor channeling any federal-local funds through the state highway department, or a special state agency; if through the state highway department, via a special rural roads division, Congressmen, on the other hand, are inclined to think in terms of direct local federal control (and patronage). **¶** The existence of 15,800 local road administrative agencies is a reminder of the grave problems that would be introduced if state control were eliminated, it was noted. **¶** State highway departments in some states have shown little desire to cooperate with local officials on their problems. Why shouldn't a state be legally able and willing to lend tools, equipment and personnel to local agencies, for example, in a free exchange of facilities for the common good? **¶** Many state highway departments have lacked rural roads divisions, properly set up and manned by engineers familiar and sympathetic with the rural road needs as contrasted with state arterial design and construction needs.

### Thorough Local Study

Hon. Dennis Chavez, Senator from New Mexico and highway legislation leader, spoke on the need of the small community. A. C. Leonard, chief, secondary road division of the Bureau of Public Roads, told of the background work done on the Report, noting that in undertaking it the Board members were assured a free hand. Regional group meetings were followed by local meetings representing the state executive committees of county highway departments. This history-making series of meetings produced an "amazing" array of factual data on the local road problem.

In discussing the Report, Leonard asked everyone to beware of the pitfalls of statistics. For example, although there are over 1,200,000 miles of unsurfaced local roads—a high

sounding total—10% of these are in one state (Texas) and 50% are in ten plains states; some states have relatively few such roads today. There is no such thing as an "average" local road condition.

To indicate the woeful lack of local road funds, Leonard took as a rough yardstick the cost of replacing ½ inch depth of gravel loss annually over all rural mileage, and found that only in a handful of states is the local road revenue sufficient at present to finance this replacement.

In states where both county and township governments are factors in highway administration, the property tax contribution runs much higher than where the township is not a factor. Those who would abolish township control, it was noted, would do better to advocate consolidating township and county financing and abolishing merely the township operations. Townships are good fund raising units.

H. A. Radzikowski, chief maintenance division, Bureau of Public Roads, cited cost figures showing the

## Here Are the ARBA Resolutions

(Omitting the flowery language)

ARBA supports the McCarran amendment which would make possible completion of the federal-aid airport program as presently authorized.

The federal highway aid policy as outlined recently by the American Association of State Highway Officials is endorsed, except that federal support is recommended at one billion dollars.

Universities are urged to establish more fellowships for post-graduate work in highway engineering.

ARBA to take immediate steps in appraising federal government agencies of the economies and soundness of utilizing private enterprise in roadbuilding.

Congress is urged to go slow in basically changing the concepts of the existing federal-state highway relationship.

The County Division of ARBA and the American Institute of Local Highway Administration favor federal aid for purely local roads, but believe no new agency should be created in the process; rather the present F. A. secondary system should be enlarged under the Bureau of Public Roads to insure a sound engineering program.

Arterials between urban downtown areas and Class 3 airports should be designated part of the Interstate system, for defense and to insure high priority of development.



## CIMA Leaders for '50

Construction Industry Manufacturers' Association, which functions as the Manufacturers' Division of ARBA, reelected Ralph K. Stiles, executive vice-president, Austin-Western Co., Aurora, Ill., president; and serving with him will be William E. Miles, manager, Industrial Division, The Colver Corp., Cleveland, Ohio, 1st vice-president; B. F. Devine, vice-president, Chain Belt Co., Milwaukee, 2nd vice-president; Julien R. Steelman, vice-president, Koehring Co., Milwaukee, secretary-treasurer; Harold F. Hess, Chicago, Ill., executive vice-president.

Seven new directors elected include Leonard C. Beck, vice-president, Cummins Engine Co.; C. Findley Boyd, vice-president, Galion Iron Works and Manufacturing Co.; E. B. Hill, vice-president and general manager, Road Machinery Division, Gar Wood Industries, Inc.; Kenneth Lindsay, vice-president, Iowa Manufacturing Co.; F. Salditt, vice-president, Harnischfeger Corp.; Gail E. Spain, vice-president, Caterpillar Tractor Co.; and Mr. Steelman. The board also named G. A. Gilbertson, vice-president, the Frank Hough Co., to fill the vacancy in the two-year directorship on the board, and W. B. Green, president, Barber-Greene Co., to fill the vacancy created by the resignation of Marshal L. Noel.

serious cost variations and wide ranges in efficiency of various county and local highway administrative units.

Eight county highway leaders, representing U.S. regions, reported on rural road conditions and problems within their respective areas. The trend of thinking was that the county is the logical unit around which to build more efficient administration of

local roads. Counties can go together, or consolidate with the townships, in order to have the volume of work to warrant the hiring of engineers and make efficient use of modern equipment. Ben Collier, of Mississippi, among others reminded listeners that the counties with engineers are the ones which have the best roads and the best road financial condition. The county engineer should have not only the design and construction functions, but also the maintenance, since upkeep is so closely related in administration and fund management.

A lack of qualified project engineers, incidentally, is reported as having slowed the secondary federal-aid road programs in some states recently.

It was urged that any federal legislation on rural roads should emphatically include incentives for the counties to raise their standards. Requiring counties or other bodies to have a qualified engineer in order to be eligible for federal aid was one suggestion.

Manton Hanna, County Judge of Waco, Texas, noted that "if there is any one place that the state highway departments are falling down, it is in their failure to make their knowledge available to the counties."

While it was agreed that the traffic count is not the only basis of thinking in giving local roads their due, nevertheless a surprisingly high percentage of all local roads still carry less than 100 vehicles daily, or even less than 10 cars per day.

## Soils Compaction Notes

The Soils Compaction conference began with an excellent paper on soils problems in railway embankments. Given by Maj. George E. Betram, Corps of Engineers, it recounted case histories of failed fills on relocations made recently around dams. The paper concluded by urging increased attention to volume change characteristics and mineralogical analysis, in addition to tests for moisture, strength, density, etc.

Chairman Bennett noted that highway engineers are giving increased attention to these factors, and that new studies of special Bentonite and other high swell soils have been undertaken. One delegate urged more fellowships in our engineering colleges to study soils problems, saying, for example, that we have little basic knowledge of the mechanics of swelling in soils, where great forces are involved and often costly roadbed failures are involved.

The new Hyster grid roller came in for discussion, and its possibilities were described by J. W. Morgan of

the manufacturer's staff. This unit, consisting of rollers employing welded open grids instead of sheepfoot, has shown great possibilities for economy and speed of compaction on test projects. Compaction at 7 to 9 mph. compared with 2½ mph. with tractor-drawn sheepfoot units, was cited as a means of saving time and money. Specifications presently are an obstacle in placing this new unit on much highway and dam work.

J. P. Moss, of Moss-Thornton Co., Leeds, Alabama, contractor on the Texarkana rolled fill dam, was present and reported favorably on his use of the Hyster units on a test section of the dam. Compaction is said to be accomplished with less penetration, and hence less tractive effort, and the roller has advantages for sealing the grade against storm water infiltration without blading.

A discussion of vibratory roller units took up the remainder of the soils compaction session.

## Airport Division Activities

The airport division of the Association was represented by a lengthy meeting, which included a summary of the federal airport program by E. C. Crites, deputy chief, airport engineering service, Civil Aeronautics Administration; the relation of airports to the Interstate highway system, by Walter R. Macatee, highway transportation specialist with CAA; and several other papers on technical aspects including one by Henry Aarons of CAA on the effect of jet propulsion on pavement design, and one on seal coating practice, by George H. Dent of the Asphalt Institute. At the final luncheon, CAA administrator D. W. Rentzel outlined the current need for expressways from urban centers to airports as an aid to civil aviation growth.

## Pan American Visitors

Thirteen Latin American Nations were represented by two score delegates at the Cincinnati meeting. At the Pan American division annual meeting session division president Rene S. Pulido y Morales, chief engineer, soils laboratory, department of public works, Havana, Cuba, presided. Among the speakers were S. M. Gross, chairman of the Pan American and Inter-Continental committee of ARBA, and assistant director of distribution, Armeo International Corp., Middletown, Ohio, Hon. Dennis Chavez, Senator from New Mexico and long a friend of Latin American people; Dr. Francisco Aguirre, secretary of the Pan American division of ARBA, and Thomas Guardia, chief engineer of the Panama section of the Inter-American Highway.



★ Minnesota Highway Commissioner M. J. Hoffman receives the George S. Bartlett award for outstanding contribution from Col. Enoch R. Needles, renamed ARBA president. Col. Needles made the award on behalf of ARBA, AASHTO and the Highway Research Board of the National Research Council, which annually select the winners.

# When Contractors Convene—

## They Talk Job Competition, National Issues, Highway Outlook

*Notes on the recent AGC convention at San Francisco.*

**B**USINESS and political trends that will affect their profits, as well as the market outlook for highway, heavy and other construction, were discussed at the well-planned convention of the Associated General Contractors, Inc. This, their 31st annual meeting, took place March 27 through Feb. 2 at San Francisco.

Sounding the gavel, retiring president Adolph Teichert, Jr., told the 1200 delegates of the Association's growth to its present 5511 members, then dwelt on a theme that has been heard increasingly in contractor meetings everywhere this past winter—competition. He also warned of the growing dominance of government in business, the construction business not excepted.

Said President Teichert on this subject, "The actions of government have been increasingly more dominant in the regulation of our social and economic actions. All fair-minded individuals will recognize that government should protect the legitimate rights of all citizens. But it should be equally evident that the government should not interpose insurmountable obstacles to the successful operation of properly conducted businesses and industries, which are essential to the growth and development of the nation."

### Decries Government Controls

Managing Director Harold E. Foreman's annual report also covered many of the economic problems affecting contracting.

Construction and the national economy was the theme of speaker W. Walter Williams, chairman, Committee for Economic Development. He said that the concern of government is to get a stable economy, and one that will continue to grow. Inflation in a subtle way is as bad for the people as a depression, and the problem is to find a way to level the peaks and valleys, he said. Heretofore businessmen have been free to do business without many controls.

This speaker took issue with the idea that we must sacrifice a free economy to achieve business stability. Mr. Williams urged campaigning for a balanced national budget, which will feed both inflation and deflation. He said that construction people cannot hope to stabilize the construction industry alone without helping do so for whole economy.

Edwin G. Nourse, famed economist, who recently resigned from the President's Council of Economic Advisors, cited events such as rising industry pension obligations, wide cashing of E-bonds by the public, and other factors suggesting business caution. The construction industry is probably at a level higher than can be maintained, he suggested. Probably some contrac-

tors will be liquidated, but a strong construction industry would survive.

### Billions for Roads

High point in the Tuesday session was the talk by D. C. Greer, state highway engineer of Texas, who appeared at San Francisco as president of AASHTO. His paper, "Shall We Wait for Traffic's Knock-out Punch?", presented facts showing the "inescapable conclusion" that highway construction is not keeping pace with highway demand. Mr. Greer outlined details of the \$810 million annual federal-aid policy adopted by AASHTO leaders, and pointed out some of the things that contractors individually or collectively can do to strengthen highway programs in their states. These steps include helping campaign to stop leaks in highway revenue to non-highway purposes; to reduce "dispersion" of state road funds; bring adoption of streamlined road legislation; get highway boards and departments removed from political domination; and get enforcement of policies on truck load limits, registrations, etc.

Highway needs were detailed by Carl E. Fritts, director, highway division, Automotive Safety Foundation. Addressing the highway contractors of AGC he dramatized the huge current production of new cars and trucks, which foreshadows intensified roadbuilding needs ahead. A tremendous

(Continued on page 63)



★ Left: AGC vice-president-elect Glenway Mason of Dayton, Ohio; Adolph Teichert, Jr. of Sacramento, and president-elect Walter R. Couse, of Detroit. Right: The late L. I. Howes (see article) of Public Roads; Carl E. Fritts, Auto-



otive Safety Foundation; Carl E. Nelson, of Logan, Utah, vice chairman of AGC highway contractors meeting; and A. N. Carter, highway division manager of AGC at Washington

# Triaxial Testing: Its Adaptation and Application to Highway Materials

## PART III—Application to Certain Bridge Foundation Problems and Flexible Base Investigations

*This is the third and last of a series of articles on triaxial testing. Part III will describe the application of triaxial tests on undisturbed soil cores to certain bridge foundation problems involving saturated soils whose strength is derived largely from cohesion and to certain flexible base investigations. The method is applicable to square or circular footings but, to*

*date, has not been applied to the design of pile foundations. F. A. Harris, Soils Engineer for the Houston Expressways, has used the method in the design of under-reamed shaft footings. He reports large savings as a result of replacing the conventional pile foundation usually employed in the Houston area\**

**By Chester McDowell**

Senior Soils Engineer  
Texas Highway Department, Austin

**T**HE proposed method consists of the comparison of the shearing strength of the material, expressed as a rupture envelope, with the anticipated shearing stress, expressed as envelopes of stress in the case of a flexible base, or as a stress circle in the case of a bridge footing. In the design of major structures which permit only very small differential settlements, consolidation tests are required in addition to the determination of shearing strength. In the case of individual piers, bents or footings for comparatively light structures which may be designed with a large factor of safety, design on the basis of shearing strength alone is considered sufficient.

**Shearing Strength:** The determination of shearing strength is made essentially as described in Part I, except that the specimens are undisturbed cores of various sizes. The sampling, transportation and preparation of specimens require special procedures.

**Sampling:** The necessary precautions always should be taken to obtain, transport and prepare cores which are as little disturbed as possible. Hand-cut cores from open pits sometimes may be taken from the subgrade of pavements but damage to adjacent

areas is large. In the case of bridge foundations the cost of pit samples is prohibitive. In either case a thin-wall, seamless, steel push-barrel, designed to be bolted or threaded on the end of the drill stem used to open the sample boring, is an efficient and relatively simple sampling device. The diameter of the tube should be at least large enough to insure that the core is representative of the material being sampled and may be as large as the equipment and economy will permit. The Texas Highway Department usually employs a 4 in. O. D., 3.62-in. I. D., tube. The outside of the lower end of the push-barrel is tapered to a cutting edge at an angle of about 7.5 degrees. The cutting edge is swaged sufficiently to permit the core to slide through the barrel without damage, usually about 0.5% to 1.5% of its diameter, depending on the expansion of the material after restraint is removed. An ejector similar to the one pictured in Fig. 5 is a convenient and sometimes a necessary accessory. A hydraulic drive is highly desirable for driving the core barrel because the rate and continuity of the drive are critical. An irregular, chattering

drive will damage the cores as they are taken. Air pressure and vacuum lines to the top of the core barrel are useful in cleaning the boring before starting the drive, and in retaining the core during withdrawal from boring.

### Core in Transporting

**Transportation:** Undisturbed cores must be packed and bedded with greatest care to prevent damage during transportation. A damaged core is of very small value yet may represent a considerable economic loss. Carrying out the preparation and testing operation as near as is practicable to the sampling location will save time and trouble.

**Preparation:** Each end of the specimen is cut plane and perpendicular to the axis. Porous stones, slightly smaller in diameter than the core, are placed directly above and below each other on the ends of the specimen. The sides are trimmed with a sharp knife to form a perfect cylinder fitting the stones. The trimming removes those portions of the specimen most likely to have been disturbed during sampling. The specimen is then weighed and measured.

**Testing:** A pressure cell, of such size as to contain the specimens, with sufficient excess space to permit lateral deformation, is deflated by vacuum and placed around the prepared test specimen. The assembly, with suitable spacer blocks bearing on the stones, only, is placed in the press. The heads of the press are brought exactly into contact with the spacer blocks without exerting any pressure. Loading and measuring devices similar to those shown in Part I will be most useful. The specimen is then ready for the application of lateral pressure.

Within the capacity of the test

*Reprints: Part I on Methods of Testing Disturbed Soils and Flexible Base Materials, and Part II on Application of Triaxial Test Results to the Design of Flexible Pavements were published in the February and March, 1950 issues of ROADS AND STREETS. If*

*sufficient requests are received, the 3-part series included in this issue will be reprinted for those desiring extra copies or quantity lots for teaching or staff circularization. Price 50¢ per copy. Address Editor, ROADS AND STREETS, 22 W. Maple St., Chicago 10, Ill.*

\*Use of Triaxial Compression Testing on Houston Urban Expressways" by F. A. Harris, Senior Resident Engineer, Bulletin No. 112, Texas Engineering Experiment Station, Agricultural and Mechanical College of Texas.

## TESTING OF UNDISTURBED SOILS FOR FOUNDATION STUDIES

Assume: Elastic isotropy and Poisson's Ratio of 0.5.

Let:

$r$  = Radius of equivalent loaded circle.

$d_v$  = Depth below footing at which shear is maximum,  $0.707r$ .

$d_s$  = Depth from surface of ground to bottom of footing.

$\gamma$  = Unit weight of soil plus moisture.

$u$  = Soil pressure (hydrostatic).

$P$  = Unit load at base of footing (Design Load  $\div$  Foot Area).

$\sigma_v$  = Vertical or major principal stress at point of maximum shear.

$\sigma_h$  = Lateral or minor principal stress at point of maximum shear.

$I_v$  = Influence value for  $\sigma_v = 0.808$  when ratio of  $d_v$  to  $r$  is 0.707.

$I_h$  = Influence value for  $\sigma_h = 0.229$  when ratio of  $d_v$  to  $r$  is 0.707.

$$\text{Then } \sigma_v = PI_v + u = PI_v + (0.707r + d_s)\gamma$$

$$\sigma_h = PI_h + u = PI_h + (0.707r + d_s)\gamma$$

Factor of Safety against ultimate failure of soil at most critical point = Ultimate compressive strength of soil (when tested at a lateral pressure equal to  $\sigma_h$ ) divided by  $\sigma_v$ .

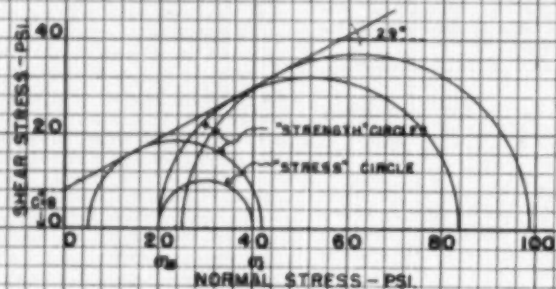


FIG. 1

equipment, lateral pressures should be selected for the individual cores so as to cover the estimated range of lateral or minor principal stresses that will be produced by the proposed loading. A single stress condition can be examined by a single core; with three or more identical cores, a continuous range of stresses can be investigated.

Having selected the lateral pressure for a particular specimen, the lateral pressure is applied to the cell while the deformation of the specimen is held to zero. This is accomplished by applying the necessary small vertical pressure with the press mechanism. The vertical pressure developed to prevent elongation of the specimen is noted. Loading then progresses continuously until the specimen fails. Simultaneous readings of load and deformation are taken at intervals of 0.01 inch deformation.

The specimen is dried at 110° C. and weighed in order that original moisture content and density may be calculated.

From the test data, Mohr's diagram of stress is plotted as described in Part I, and a rupture envelope repre-

sented ultimate shearing strength is determined. If the test is very carefully conducted, Poisson's ratio may be estimated from the vertical pressure developed when the lateral pressure was applied without elongation of the specimen. Poisson's ratio equals one-half the ratio of the developed vertical stress to the applied lateral stress.

### Estimating Footing Stress

**Estimation of Stress:** In the case of a bridge footing the load is assumed to be applied uniformly to a circular area. If the actual loaded area is square or slightly rectangular, the equivalent circular area may be used in calculations without introducing an error in excess of 4% or 5%. Fig. 3 offers a convenient graphical method for determining the radius of a circular area equivalent to a square of given dimensions.

The problem of stress distribution under a circular loaded area was solved by A. E. H. Love and reported in the 1929 "Philosophical Transactions of the Royal Society of London." Certain tables of influence values de-

rived from his work, together with a discussion of the solution by Warner Tufts, may be found in "Public Aids to Transportation," Vol. 4, 1940, Appendix C, or in less extended form, in E. S. Barber's paper on page 28 of Vol. 26, "Proceedings of the Highway Research Board." Since Love's solution is for a load applied to the surface of a semi-infinite plane, it is mathematically incorrect to use it for a load applied below the surface, as in the case of a bridge footing. However, when the weight of the overburden is added as a superimposed force, it is assumed that the net error is not large enough to constitute a serious objection.

It is further assumed that the soil has a Poisson's ratio of 0.5. The very large stress difference which exists theoretically near the periphery of the loaded area is assumed actually to be relieved to the extent that it is not critical. This being the case, the greatest stress difference will occur on the central axis at a depth of 0.7071 times the radius of the loaded area. If the strength of the soil is derived largely from cohesion, as often is the case under bridge footings, it is necessary to estimate only the combined stresses at this one point. From the tables, influence values for vertical stress ( $\sigma_v$ ) and radial stress ( $\sigma_h$ ) may be found for depth/radius ratios of 0.25, 0.50, 0.75, etc. If these values are plotted against depth ratios as shown in Fig. 2, the influence values for depth ratio 0.7071 may be found by interpolation. The applied unit stress multiplied by the appropriate influence values will equal the vertical and radial stresses at the point, due to the structure. Since soil is removed from the excavation and replaced by the footing, the net applied load is assumed to be the design load minus the weight of excavated material. Since the coefficient of pressure at rest for such soil is unity, the soil exerts vertical and radial stresses equal to the unit weight of the soil multiplied by the depth. These soil stresses plus the stresses due to the structure are the total stresses at the point.

**Strength vs. Stress:** Fig. 1 shows the plotting of Mohr's diagram of stress representing the strength tests on the undisturbed cores from the area of the footing. Superimposed on the diagram is a stress circle representing the total vertical and radial stresses at the critical point on the axis of the loaded area. These stresses were estimated as shown in the upper part of the figure. The factor of safety against ultimate failure of the soil is assumed to be the ratio: Ultimate strength of the material determined at a lateral



## HOW

Wisconsin taxpayers save money

### with CONCRETE PAVEMENTS

Official figures (1945-1948) show that in Wisconsin those counties with the most concrete on state trunk highways generally have lower maintenance costs per mile per year. The counties below illustrate how maintenance cost usually goes down as the amount of concrete paving goes up.

% OF STATE TRUNK HIGHWAY MILEAGE PAVED WITH CONCRETE	COUNTY	ESTIMATED ANNUAL MAINTENANCE COST PER MILE OF STATE TRUNK HIGHWAY (1945-1948)*
90%	SHEBOYGAN	\$296
72%	WALWORTH	\$357
66%	GREEN LAKE	\$443
53%	GREEN	\$561
44%	ASHLAND	\$691
32%	SAUK	\$798
28%	BAYFIELD	\$864
15%	LAFAYETTE	\$1,018

Public officials from coast to coast can save money for taxpayers by specifying concrete for roads and streets. Concrete pavements last longer and usually cost less to build than other pavements of equal load-carrying capacity. Result: **low-annual-cost** service.

Write for free booklet, "Road Service Maintenance Costs." Distributed only in the United States and Canada. Address Dept. 4-28.

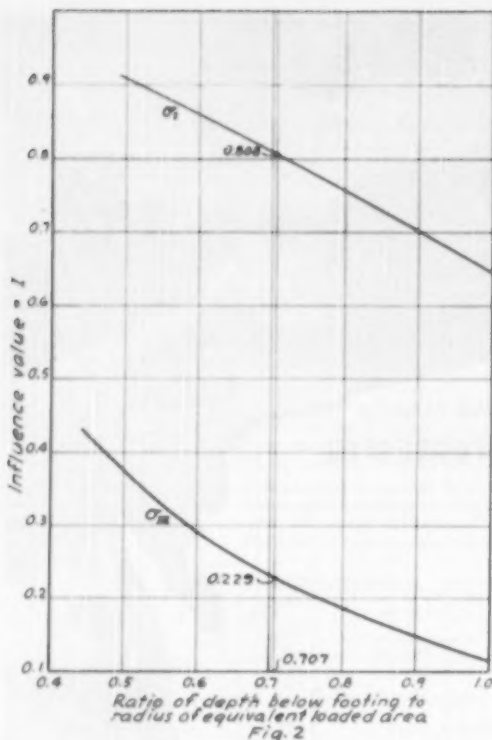
\*Total of maintaining road surface plus right of way

## PORTLAND CEMENT ASSOCIATION

33 WEST GRAND AVENUE, CHICAGO 10, ILLINOIS

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

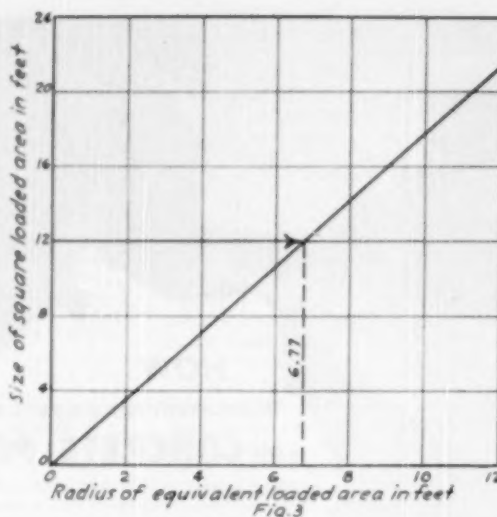




pressure equal to the minor principal stress at the point of critical stress, divided by the major principal stress at the critical point. In the designs made by F. A. Harris for the Houston Expressway, factors of safety of 2 to 2½ were considered sufficient. After nearly two years of service there have been no noticeable settlements in the

limit of soils suitable for examination as described herein without a more complete stress analysis.

Prior to testing, undisturbed cores should be in equilibrium with respect to moisture and density under the conditions of proposed use. If cores are taken at a relatively great depth to represent the subgrade of flexible base



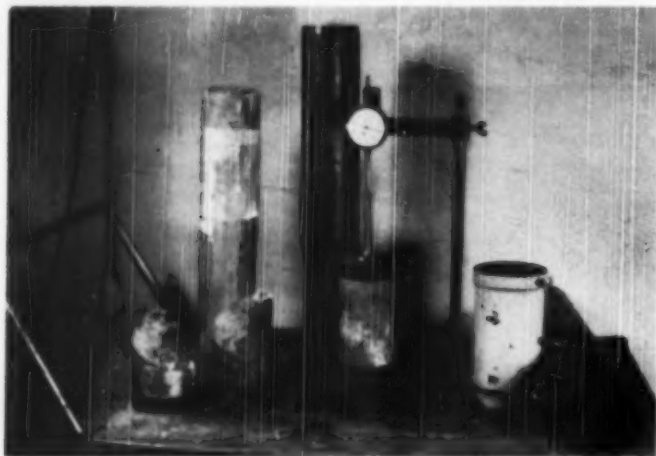
structure so designed.

The soil whose rupture envelope is shown in Fig. 1 has a very considerable component of frictional strength. It is probably near

in a proposed cut (not to be cut below grade and recompacted), the cores should be saturated under the proposed new surcharge before testing. Relatively shallow cores, representing the subgrade under an existing, unbroken base, probably are in equilibrium and require no processing. If these shallow cores are from an uncovered subgrade, they should be subjected to capillary wetting under the proposed surcharge. A rather large number of cores may be required under the latter condition to arrive at average values. When cores representing subgrades of flexible pavements have been processed and tested, the rupture envelopes may be superimposed on the Classification Chart shown in Part II, and may be judged according to the table of loads and base depths which accompanies the chart.

#### Example of Application

The following example is based on data obtained for a grade separation structure where the highway passes underneath the railroad. It is desired to place footings approximately 10 ft. below the highway grade line in a sand-clay cut which has a wet unit weight of 125 lb./cu. ft. This probably is the minimum depth of penetration because the roadway ditches will drain both surface and underground water. The problem is to determine the size of an adequate spread footing for this structure which has a pier load of 600 tons. Since only a few footings are needed, under-reamed footings probably are not feasible. Assuming that each pier is to rest on two 12-ft. square footings on 21-ft. centers, and that the test results showing Mohr's envelope of failure for the soil involved are as shown in Fig. 1,

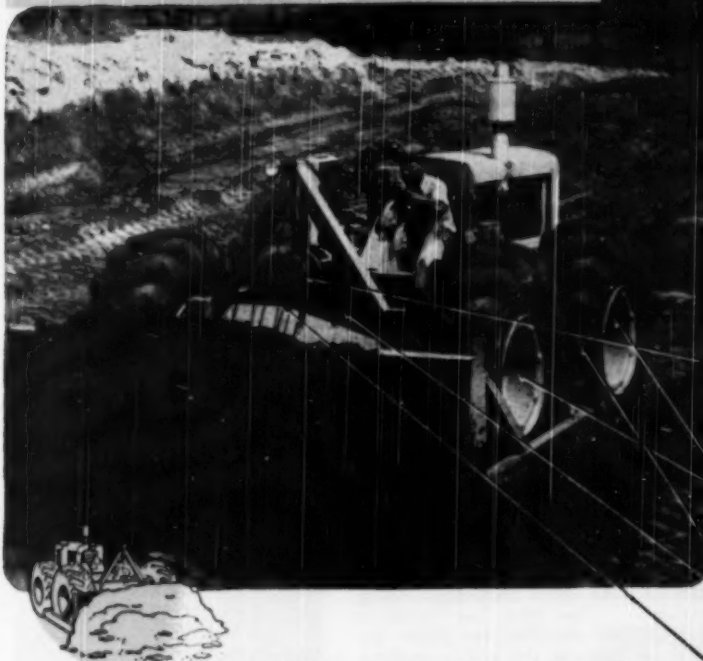


★ Fig. 4. Left to right: soil core opened on shearing plane after testing; paraffin coated soil core; push-barrel sampling tube; apparatus for measuring height of cores; triaxial cell; push-barrel sampling tube

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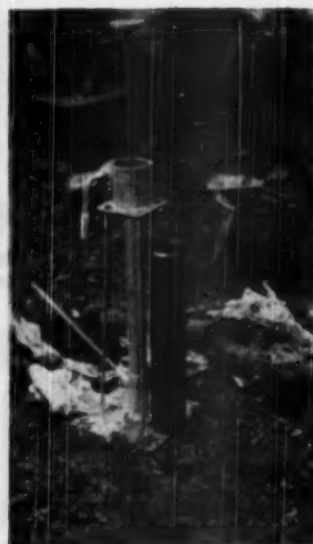
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# SCHIELD BANTAM

The **THRIFTY** machine with the **BIG** earning range



★ Fig. 5. Hydraulic core extractor developed by bridge and equipment divisions of Texas highway department. Upper: Extractor with plunger extended. Sampling tube resting on base of extractor. Lower: Extractor in operation showing soil core partially extruded out of sampling tube

the problem may be solved as follows:

1. From Fig. 3 the radius "r" of a circle equivalent in area to a 12-ft. square is equal to 6.77 ft.

2. From Fig. 1

$$d_1 = .707 \times 6.77 = 4.8'$$

$$d_2 = 10'$$

$P = 330$  tons plus weight of concrete pier minus weight of excavated soil,

$= 336 \times 2000 + (12 \times 12 \times 10)$   
 $(150-125)$  divided by 144  
 $= 4833 \text{ \#/sq. ft.} = 33.6 \text{ psi.}$

$F_v = .808$  (See Fig. 2)

$F_L = .229$  (See Fig. 2)

$eI = 33.6 \times .808 + 14.8 \times 125$  divided  
 by 144 = 40.0 psi.

$eIII = 33.6 \times .229 + 14.8 \times 125$  divided  
 by 144 = 20.5 psi.

Factor of Safety = 84 divided by 40  
 = 2.10

A method of determining the bearing value of undisturbed soil foundations by triaxial tests and its application to a specific bridge footing problem has been presented. The possibility that these tests can be performed while on the drilling site offers a rapid means of field evaluation and control.

### Inspectors Are Not Detectives

The inspector is a vital part of any construction project. He is on the job not only to protect the interests of the owner, but also to be of assistance to the contractor. These points were emphasized by Miles N. Clair, of Thompson and Lichner Co., Brookline, Mass., at the recent ACI annual convention in Chicago.

"The inspector must see that the plans and specifications are fulfilled and translated into good construction. He must also be a coordinator, expeditor and adviser. He is not a detective to 'catch' the contractor," Mr. Clair said. "There are many situations where the inspector can assist the contractor without in any way jeopardizing the owner's interests. Such instances go a long way toward promoting good personal relationships between the two parties and the work benefits," was the statement made in a paper presented by Donald C. Andrews, Turner Construction Co., New York, and Nomer Gray, Walter Kidde Contractors, Inc., New York. The authors went on to state that "cooperation is a two-way street" and that it was important that contractor, inspector, owner "work as a team."

Lewis H. Tuthill, U. S. Bureau of Reclamation, Denver, Colorado, stated that "inspection of any kind can be no more effective than that permitted by the specifications, particularly, by the established job standard of inspection." He said that factors which influence the effectiveness of inspection include specifications, management policy, ability of the contractor and supervision of the inspector. "Where effective inspection is wanted, management must see that the specifications and the setup of the job are such that inspection can be effective," Tuthill concluded.

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 HYDRAULIC HOISTS AND BODIES



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For stockpile loading, there's no ramming, just a steady push into the pile, with the Athey Force-Feed Loader, equipped with the low-speed axle.



An Athey Force-Feed Loader, equipped with the new, heavy-duty, low-speed axle, can take the task out of your loading, just as over 1,000 others have done for their owners.

The low-speed axle provides the all-round answer for all-round loading problems with these advantages. Loading speeds from .27 to 1.73 m.p.h. fit the loader to *better* stockpile-loading and *greater* production. Power is tied to traction, with the use of larger, single rear tires . . . every one of the "horses" in the heavy-duty industrial engine is put to use. The use of larger tires, with the heavy-duty axle, also increases flotation and allows the loader's use in any material. The greater torque capacity of the low-speed axle reduces the stress and strain of tough jobs and so prolongs the work-life of the loader. High travel speeds reduce travel time between job-sites. These advantages pay off wherever greater production, better traction and improved flotation are first needs.

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**FORCE-FEED LOADER**


★ N. K. Dickerson, Jr. of Dickerson, Inc., Monroe, N. Carolina, new chairman of AGC's highway contractors division; with vice-chairman M. C. Miller, of San Ore Construction Co., McPherson, Kansas

(Continued from page 58)

ous number of miles of main roads are still paved less than 20 ft. wide, and need immediate widening to at least 24 ft.—just one small phase of the construction market ahead in roads. Fritts reminded that unsound highway management is a retarding force in highway development, along with a lack of laws permitting acquisition of right-of-way and access control. "The public doesn't understand that the capacity of even the best de-

## New AGC Officers and Directors

**President:** Walter L. Couse, of Walter L. Couse & Co., Detroit, Mich.

**Vice-President:** Glenway W. Maxon, of Maxon Construction Co., Dayton, Ohio.

**Directors:** (varying terms) A. S. MacDonald, Strong & MacDonald, Tacoma, Wash.; Wayne S. Sutton, Washington Asphalt Co., Seattle; John MacLeod, Macco Corporation, Paramount, Calif.; Fred J. Early, Jr., Fred J. Early Co., San Francisco; A. S. Horner, A. S. Horner Const. Co., Denver, Colo.; W. Murray Werner, The Werner Co., Shreveport, La.; J. Rutledge Hill, Gifford-Hill & Co., Dallas, Texas; Carl W. Olson, Olson Const. Co., Lincoln, Nebr.; L. D. Sinclair, Foley Brothers, Inc., St. Paul, Minn.; Robert E. O'Connor, J. C. O'Connor & Sons, Inc., Fort Wayne, Ind.

**Chairman: Highway Division—**N. K. Dickerson, Jr., Dickerson, Inc., Monroe, N. C.; M. C. Miller, San Ore Construction Co., McPherson, Kans., vice-chairman.

**Heavy and Railroad Div.:** John MacLeod, of Macco Corporation, Paramount, Calif., chairman; George Heller, Johnson-Drake-Piper, Minneapolis, Minn., vice-chairman.

**Building Division:** D. A. Harmon, Harmon Const. Co., Oklahoma City, chairman; H. C. Turner, Jr., Turner Construction Co., vice-chairman.



signed roadway can be swiftly destroyed, and safety jeopardized, if unrestrained ribbon development is allowed to clutter up adjacent land."

Another high point was a paper on highway financing of Public Roads given by Dr. L. I. Hewes, who died suddenly two days later (see news item in this issue). Dr. Hewes told the contractors of the need to consider the earning power of the traffic stream in a new approach to highway financing. He proposed an "earnings fund" representing the calculated savings in vehicle operation from the road improvement, which earnings would often be 0.5 cents per vehicle-mile. Dr. Hewes' "Block Bond" idea is to block out road developments, section by section, and issue bonds against the traffic earnings of each section. An authority could be set up by legislation to borrow the funds.

The afternoon highway session was devoted principally to a discussion of the civil airport program. Philip A. Hahn, chief, airport engineering division, CAA, told of \$99 million in accumulated requests for urgently needed projects. James D. Ramsey, president, National Association of State Aviation Officials, stressed the need to tap the reservoir of potential airline travelers and personal plane owners.

(Continued on page 70)

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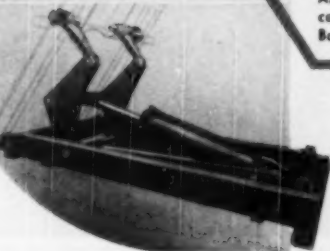
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# KNOCKIN' Out the Yardage

## Arcole's Earthmoving Fleet Had 298,000 Yd. Month

One of the best equipped earthmoving contractors with headquarters in the Chicago area is Arcole Midwest Corporation of Evanston, Ill. Last season this company graded an 8-mile 4-lane-divided section of U.S. 12 near Lake Zurich, Illinois, achieving an average of 11,700 cu. yd. of earthmoving per 9-hour working day during their peak month of September. From Sept. 1 to Oct. 5 (25 working days) the volume moved was 298,000 cu. yd.

Material consisted of earth excavation, borrow excavation, peat removal, bank run gravel and gravel borrow. Top soil was stripped and stocked. A start was also made on concrete paving before winter shut-down.

Following is a tally of the grading equipment used on the different steps in this job as reported by Paul W. Wood, resident engineer. The list represents duplication of the contractor's items, being rather a summary of equipment assignments from available units.

### Earth Excavation

- 4 12-yd. LeTourneau scrapers with D-8 Caterpillar tractors.
- 2 12-yd. Gar-Wood scrapers with HD-19 Allis-Chalmers tractors.

### Borrow Excavation

- 6 10-yd. LeTourneau tounapulls.
- 3 15-yd. Wooldridge Terra Cobras.
- 1 2-yd. Northwest dragline with six 10 cu. yd. International trucks, and two 15-yd. Euclid wagons.
- 2 D-8 Caterpillar tractors as pushers.

### Peat Removal

- 1 2-cu. yd. Northwest dragline with six 10-yd. trucks.

### Bank Run Gravel and Gravel Borrow

- 1 2-cu. yd. Lorain dragline with ten 10-yd. trucks.

- 1 Cedar Rapids portable crushing and screening plant.

### Fill Equipment Embankment

- 3 Double-drum sheepsfoot roller units with discs, drawn by D-8 Caterpillars.
- 2 D-12 Caterpillar motor graders.
- 1 HD-19 Allis-Chalmers bulldozer.
- 1 3000-gal. water tank and International truck tractor.

### Fill Equipment, Gravel Borrow

- 1 Pneumatic Roller.
- 1 Allis-Chalmers rubber-tired tractor.
- 1 Motor grader.

### Fill Equipment Bank Run Gravel

- One bulldozer and one sheepsfoot roller.

## Double-Shift Paid Off on Central Michigan Job

Contractor A. L. Dyer & Sons of McBrides, Mich., used three C Tournapulls to improve Michigan highway 57 near Carson City, Mich. The job involved grading and drainage work and stabilizing of aggregates and widening of the highway. The rigs were used on two 8-hour shifts. 210,000 cubic yards of material—mostly "sugar sand" but with some top soil and clay—was moved.

Borrow pit and fill were 1½ miles apart, with round trip of three miles and grades up to 2%. Scrapers had to

travel through heavy traffic since a considerable part of the haul road was over a highway. After a fill 1600 ft. long by 16 ft. high was built on a section through a swamp, it underwent hydraulic consolidation. In this process, water was pumped into the sand fill to displace the swamp muck under the fill, thus settling the fill on a firm footing.

In addition to building the swamp fill, the scrapers made small cuts and fills to smooth and widen the remaining 5 miles of old road bed.

The Tournapulls, on arriving at McBrides, were sent under their own power 17 miles over the highway to another job.

## Canadian Contractor Makes Fast Concrete Run

With a top day of 3,240 lin. ft. of 12"x8" lane laid down, the firm of Brabant Bros. Ltd., of St. Boniface in Manitoba, paved 13.7 miles of Highway 75 south of Winnipeg last summer. This is the first of several contracts that will result in a new pavement all the 65-mile distance to the U.S. border.

The 100% mechanized outfit included a "Blaw-Knox package" of integrated equipment, consisting of a MultiFoote 34E dual-drum paver, and such items as road forms, a subgrader, vibratory spreader, and finisher all by Blaw-Knox, a Koehring longitudinal power float; also Blaw-Knox clamshell buckets and batching equipment at the proportioning plant.

A ten-year record of no-accidents to maintenance workers is announced by the Pennsylvania department of highways for the 150 miles of state highways lying within the city of Philadelphia.

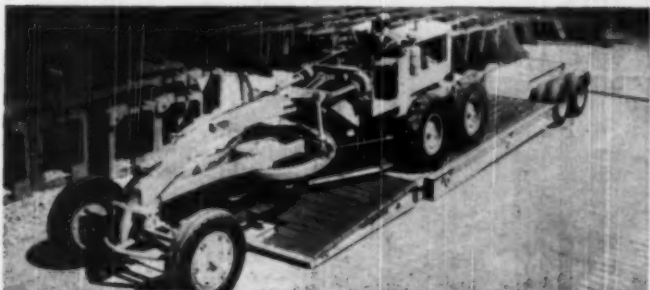
The state-wide accident rate on all state highways for 1949 was 9.6 fatality rate per million man-hours worked, a drop from 11.8 in 1948 and 13.1 in 1947.



★ Tournapull on Michigan highway job

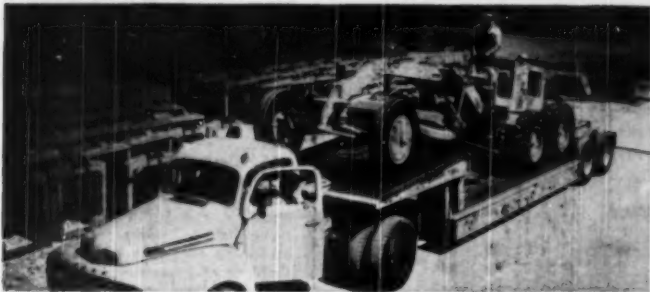
## LOADING MOTOR GRADERS MADE EASY BY FOLDING GOOSENECK

Loading equipment quickly, and without ramps or cribbing is possible with a new patented "Carryhaul" Folding Gooseneck recently introduced by the Martin Machine Company, Kewanee, Illinois. The new trailer features a Folding Gooseneck which, when lowered to the ground, forms a loading ramp. Front end loading permits a very low platform height, assuring greater safety, greater clearance of viaducts, bridges, wires. The new trailer is available in capacities up to 100-tons. Like other Martin "Carryhaul" trailers the new Folding Gooseneck is being sold exclusively through "Caterpillar" dealers everywhere.



New Folding Gooseneck lowered to form ramp for loading motor grader. No loading ramps or cribbing are required. Loading is completed in a few minutes.

Below: Folding Gooseneck raised to towing position. Low platform height offers greater clearance, safety.

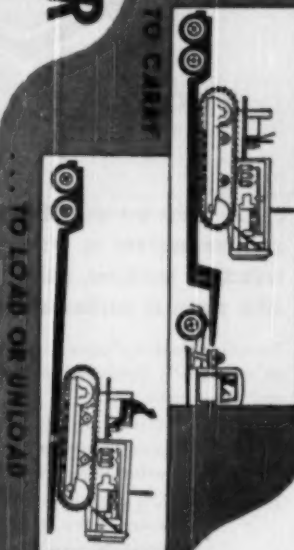


### World's Largest Folding Gooseneck Trailer



Loaded for shipment to Humble Oil Company, West Baytown, Texas, this 65-ton Martin Folding Gooseneck trailer stood 17 ft. 4 in. high on the car. A 2 in. head clearance permitted travel in daylight only.

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## AGC Too Passed Some Resolutions

At their San Francisco convention, the General Contractors resolved as follows:

❶ Private and public construction contracts should be awarded to responsible general contractors, to take full advantage of free and open competition, and to insure most economical work.

❷ One all-inclusive contract should be awarded for each project, or major portion, so as to capitalize efficiency that comes through full responsibility and coordinated, centralized direction.

❸ Government agencies should adopt procedures which will not disrupt established industry practices, or hamper industry operations; and which do not upset lawful, established employer-worker relations.

General contractors should be required to furnish all materials for projects, so as to permit better coordination of work and economies in purchasing.

AGC endorses the \$810 million annual federal highway aid policy of AAHSO, and further recommends that the policy be established on a long-range basis so that the highway construction industry can organize for most efficient operation; and that construction contracts continue to be awarded to the lowest responsible bidder after public advertisement, for maximum results per dollar.

Administration of unemployment compensation funds should be placed under full control of the state government so that effective steps can be taken to prevent abuses.

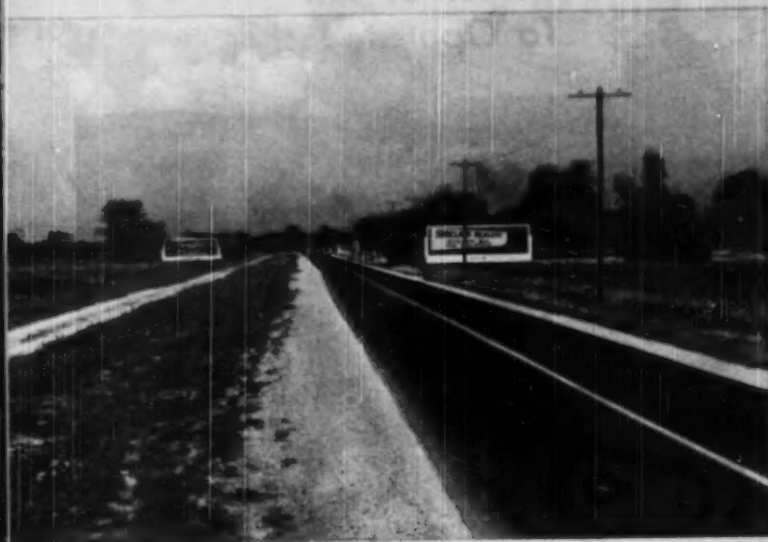
Customary differentials in wage rates and working conditions between highway and heavy construction and building construction should be maintained as conducive to maximum economy in these types of construction.

The provision in the standard federal construction contract form, giving the contracting officer the right to decide all disputed questions of fact—subject to appeal to the head of the department whose decision shall be final and conclusive—is causing mounting confusion and hardship to the general contracting industry. This provision denies the contractor the right of recourse to the courts, and subjects the government to the possibility of extra costs because of contingencies to protect against uncertainties. Recommended that this contract form carry a provision giving both parties to the contract the right to carry the dispute to a court of competent jurisdiction or board of arbitration. This will benefit both industry and government.



# Bituminous

## ROADS AND STREETS



### BEFORE

Ohio US 25 between Bowling Green and Perrysburg, before modernization. Old 18 ft. roadway badly overtaxed by very heavy traffic. Note that right of way has providently been provided for future double highway. Improvements on this route were begun by the Ohio division of highways in 1947.

### AFTER

The same road transformed into a high standard 4-lane divided highway. As described in detail in Feb., 1948, "Roads and Streets," the old road was widened to 22 ft. and given an asphaltic concrete resurface, and a new parallel roadway built consisting of water-bound macadam stone base and asphaltic concrete blader and surface courses.



APRIL, 1950

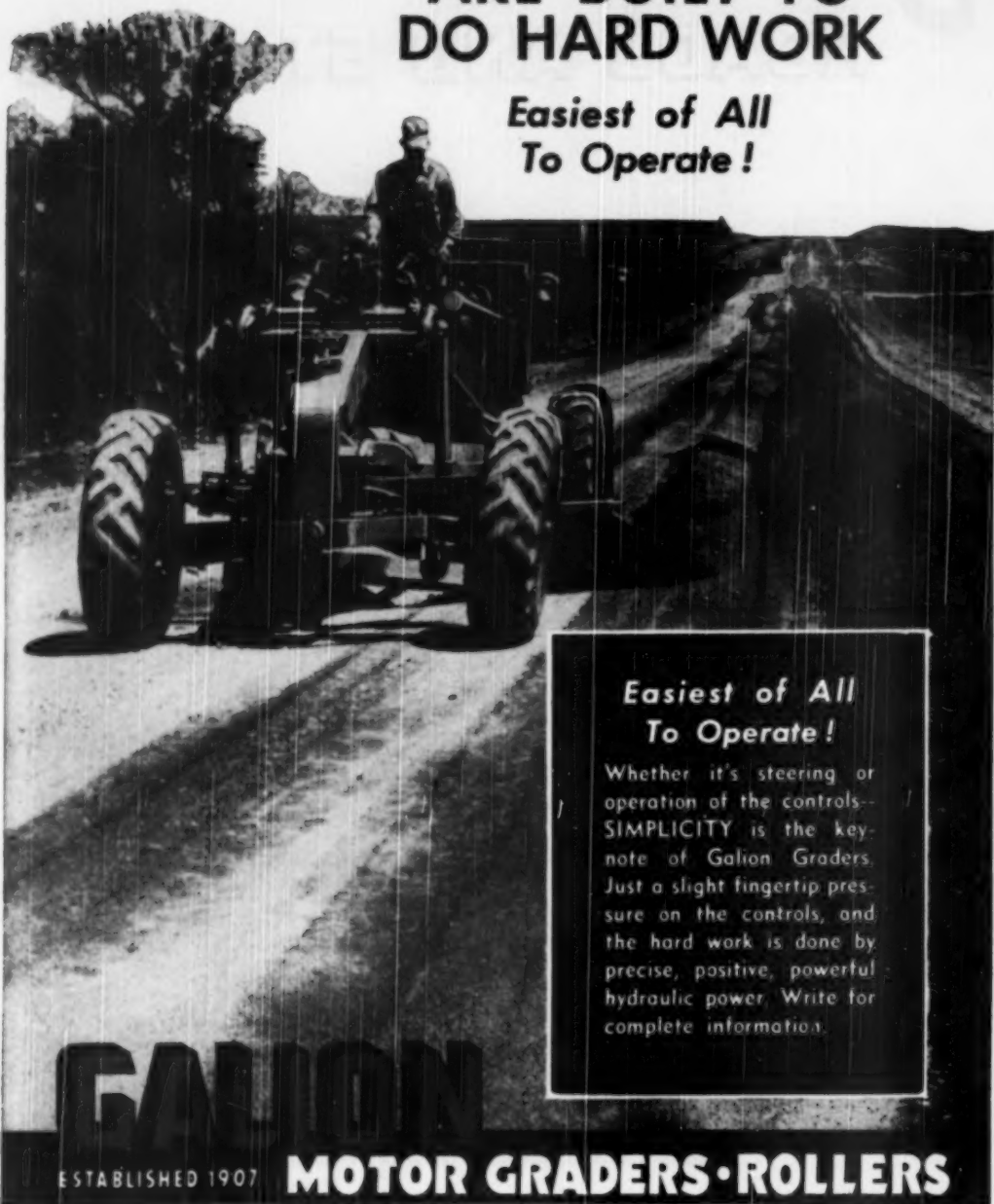
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### In This Issue

Low cost Airport for a small southern community . . . Road Modernization Problems and Methods in Texas . . . Design of Seal Coats as developed in California

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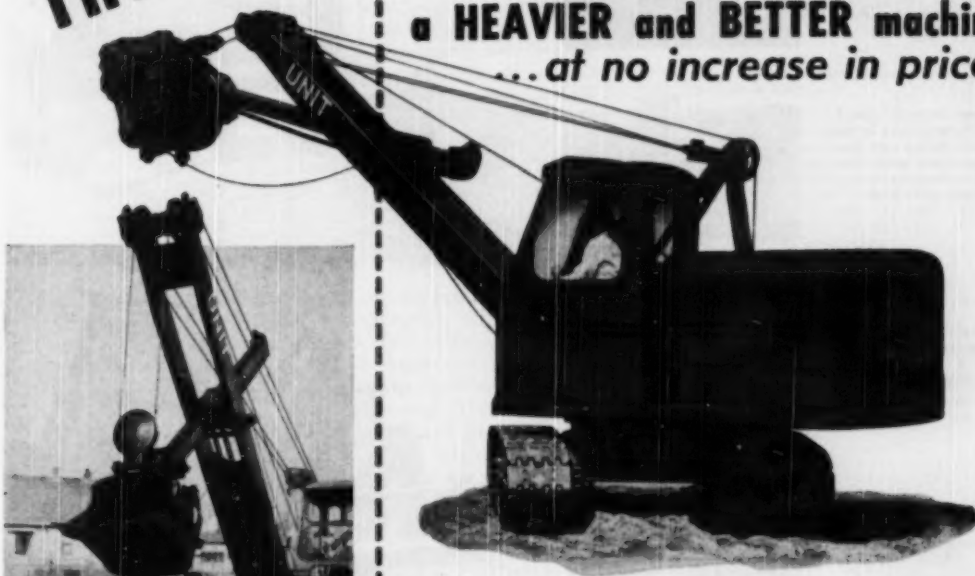
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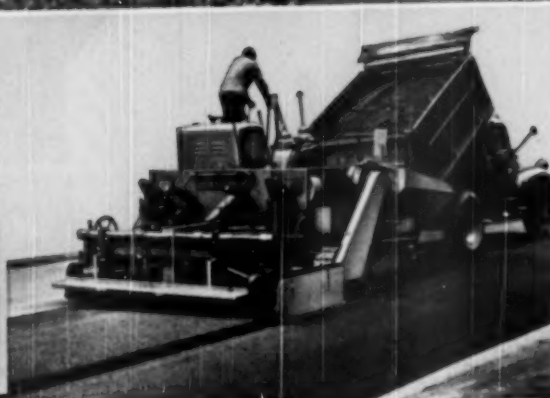
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5' 6" to 12' 6" without  
cutting or removing parts.



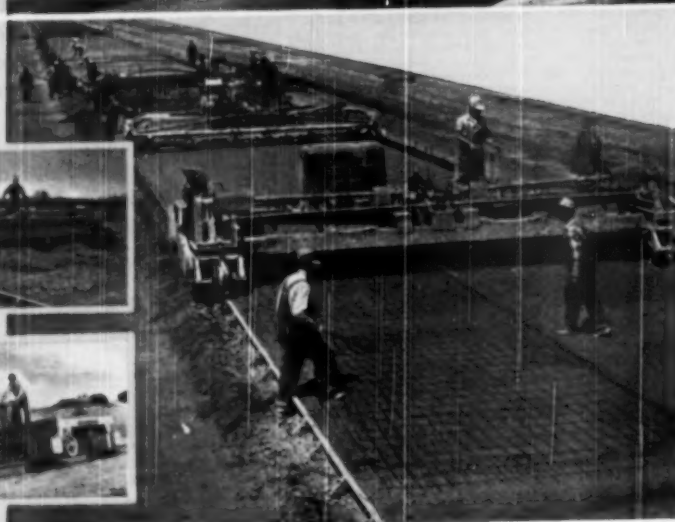
**12' Straightedge Run-  
ners** equalize subgrade in-  
cregulation. Automatically  
controlled to match estab-  
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**So-Mixing, Compacting  
Spreader** Sows seedlin-  
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## **Jaeger Model BP-5 precision bituminous paver**

The automatic-leveling paver that lays all types of bituminous materials up to 12½' with almost instant width adjustability, without adding or removing parts. Fast oscillating bevel-tooth screeds work material to uniform density not possible with tamping. All traction and heavy load are confined to subgrade (no premature sealing.) Machine automatically matches adjacent course, curb or other grade line and can pave flush to curbs or gutters. Teams with the Jaeger Aggregate Spreader for fast, labor-saving production of high-type roads, streets, airports — at low costs not possible with older equipment.

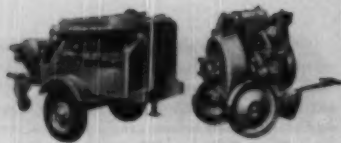
## **Jaeger concrete spreader and finisher "teams" for labor-saving mass production behind big pavers**

**Type "X" Diagonal Screenshot Finisher** — directly saves one to two shovelers because its diagonal rear screed can finish flush to the upper form on super-elevated curves and pitched slab. Increases accuracy on all work and can finish faster without tearing stiff concrete.

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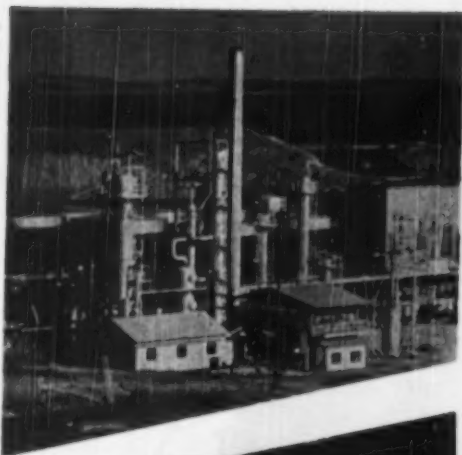


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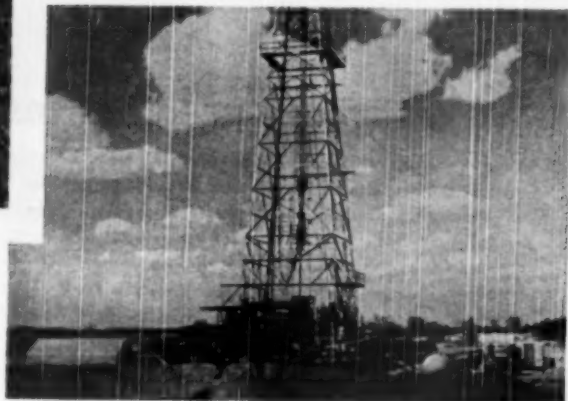
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★ Modern airport now serving Brunswick, Georgia

Use of sand-asphalt and skillful turfing methods produce 2-runway field economically for light traffic use



## Low Cost Airport for a Small Southern Community

**B**RUNSWICK is a progressive Georgia coastal city of 20,000 population, located in an area famous for Sea Island and other popular seaside resorts. As a stimulus to private flying and commercial air service, Glynn County and the City of Brunswick sponsored a 2-runway airfield as a CAA project. Selection of a site for the 342-acre field was no problem from a grading standpoint, for the area abounded in "flat as a table" land. The governing factors in design were drainage and the nature of the soil, which for the site selected is a fine alluvial sand. In the absence of good aggregates the most practical procedure for a low-cost field was to design a sand-asphalt base for runways and taxiways, utilizing the materials in the site, and to grow—if possible—a sufficient turf to control erosion over the graded area.

The airfield consists of two runways in L-formation, respectively, 75 x 1900 ft. and 75 x 2300 ft., with 50-ft. taxiways. Runway base consists of 5-in. compacted thickness of mixed-in-place sand-asphalt, increased to 6-in. thickness at runway ends and the runway intersection. Taxiways also were 6 in.

Because of the low, flat terrain,

drainage was a problem. Before starting the grading work on the runways, two large outfall ditches were dug, using a  $\frac{1}{4}$ -yard Bay City dragline, and the necessary cross drains installed under the runways carrying the drainage from the side ditches into these outfall ditches. Through construction of this drainage system a stable roadbed was provided for the base course through grading the runways with a fill of from one to two feet.

### Runway Construction Method

The light grading involved was performed with Caterpillar motor graders and Wooldridge tractor-drawn scrapers. Fill was rolled with a Tampo pneumatic roller drawn by an International wheel-type tractor.

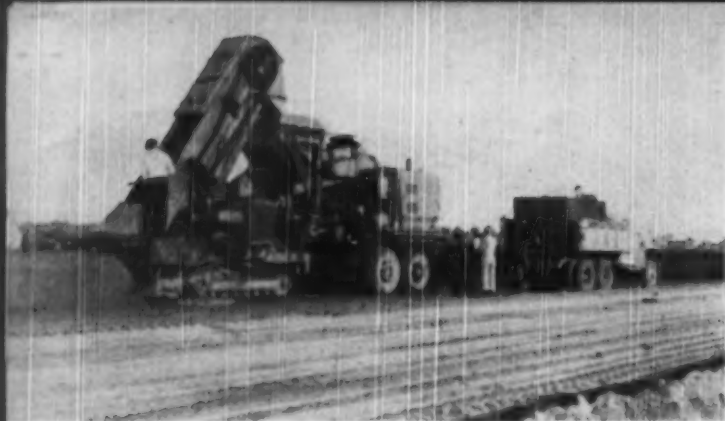
After pavement areas were thus graded, fine graded, and compacted, the top 5 or 6 in. of material was windrowed, mixed in the windrow using a heavy-duty Barber-Greene travel plant, spread by Caterpillar No. 12 motor graders, and sealed with the pneumatic roller.

This work was performed in December, 1948, and the following January, at a time of year when even the

fine sandy soil encountered here was too moist for final processing of the base. However, asphaltic mixing was performed.

Representing an innovation for this region, it was decided to use RC-3 asphalt (80% residue) with a 60% asphalt content, instead of RC-1. The mixture was designed to include about 4% bitumen residual. After mixing, aerating was carried out just far enough with the blades to make it evident that stripping would take place if continued, at which point the mix was spread in a semi-finished condition to serve as an emergency landing surface through the remainder of the Southern winter. A couple of passes with a pneumatic roller packed the mix down sufficiently for this purpose.

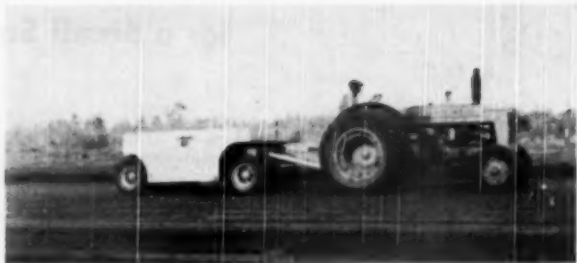
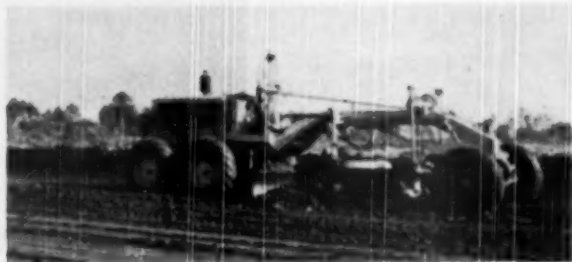
About mid-April, work was resumed on the first warm, sunny Spring days and most of the final processing was completed by mid-May. The procedure was to pick up the sand-asphalt with a pulverizing mixer (Seaman) aided by discing to thoroughly loosen and aerate the mix. When trial passes determined that the moisture was about right for good processing, two motor grader operators began in ear-



## Grading and Base Preparation in Progress at Brunswick Airport

★ Travel plant methods were used for mixing the sand-asphalt base (Barbor-Greene machine)

★ (Left Below): The runway and taxiway areas were built up about 2 ft. during the field grading. Woodridge scraper shown



★ (Upper Right): Laying down sand-asphalt mix with Caterpillar No. 12's

★ (For Left): 14,000-gal. storage tank, tank heater, Littleford pump, and 700-gal. service truck on RC-3 asphalt for base mix

★ (Lower Scene Above): Laying down the mix in winter. Tampo roller with International tractor

★ (Left): Reworking the mix in May, following three months' temporary spread-out





★ Sowing Bermuda grass by "hand machine"

nest manipulating the mix, followed by a pneumatic roller as the mix was thoroughly compacted and fine bladed to accurate crown. Expert operators on the blades greatly aided the job. The mix kneaded well at 8% moisture and about 80 to 85 degrees midday air temperature, as observed at the time the final accompanying photograph was taken on May 13.

The sand in the mixed-in-place base is typical of the Coastal Plains material and is of the following gradation:

Passing the No. 10 sieve —	100%
Passing the No. 60 sieve —	98%
Passing the No. 100 sieve —	42%
Passing the No. 200 sieve —	5%

The Florida bearing value of this material runs about 30 psi., a satisfactory value for securing proper stability. In general, the moisture content was held below 9% during the



★ Soil as compacted with the Cultipactor after seeding

mixing operations. However, in closing short sections it was found desirable to go somewhat higher and work out the excess moisture content by aerating the asphalt mix.

The RC-3 asphalt, being heavier than customarily used on similar local paving was watched with interest by the engineers. It proved to give a surprisingly workable and flexible mix. Moisture content, as noted before, was a critical factor.

The runways were sealed with AC-15 asphalt applied at 0.2 gal. per sq. yd. at 275 deg. F. This was covered with 3/4-in. slag, 12 lb. per sq. yd., put on by a spreader and rolled in by the rubber-tired roller.

### Fertilizing and Seeding

The graded areas, including unpaved portions of the 300-ft.-wide landing strips totaling about 40 acres, were prepared as follows: The soil was conditioned for seeding by the same Seaman mixer used on the runway reworking, this step being started the first week in April, when there was plenty of moisture in the ground to insure germination and root development before the dry summer conditions began.

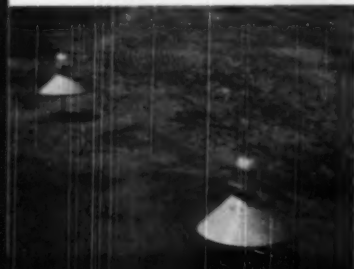
When moisture and weather conditions were judged to be just right, the field was given an application of fertilizer and seed. About 200 lb. of super phosphate and 200 lb. of ni-

(Continued on page 80)

★ Conditioning soil for seeding, using a Seaman Pulvimeter



★ Two of the medium-intensity Westinghouse runway lights of the type used at Brunswick



★ Inexpensive white-painted timber "circle" built around the windsock pole

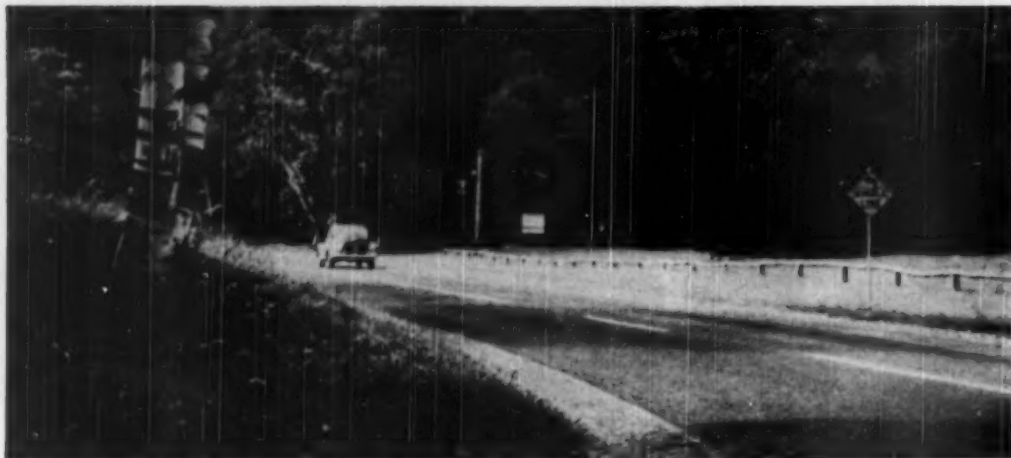


★ Electrically illuminated sock

81



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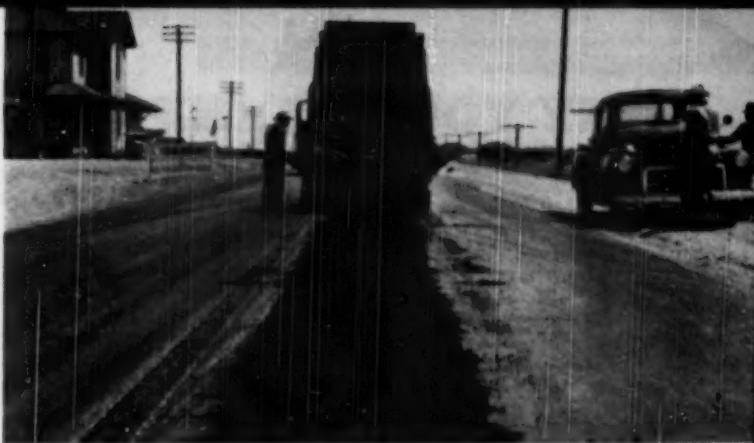
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★ Shop-built windrow oven used to obtain uniform distribution of leveling course after completion of base widening—Hudspeth County, Texas

Two case examples of highway restoration are given here, described by the fellow who often is in best position to tell all the ins and out and "whys" of a complicated project



## Texas Problems and Methods of

# Road Modernization

**By Horace S. Kerr**

Superintendent,  
H. B. Zachary Co., San Antonio, Texas

THE necessity for modernizing existing highways in Texas did not occur as early as it did in many states. The delay was the result of the very low maximum axle load limit of 7,000 lb. that existed prior to World War II. Although there was no weight limit, the gross vehicle weight seldom exceeded 20,000 lb. This maximum gross load did not approach the capacity of the pavements and they did not show distress as early as the pavements in states that permitted much heavier loads.

The sudden occurrence of heavy interstate war-time truck transportation in 1942 made it imperative that the load limit be increased. The maximum gross load without special permit was set at 48,000 lb.

Soon after this increase, pavements began to show distress. Some

portland cement concrete pavements began "alab pumping." Pumping developed in intensity and spread geographically in direct proportion to the increase of heavily loaded vehicles; by the end of the war it was apparent that many pavements throughout the state must receive immediate repairs, or improvement. On numerous sections not only were repairs necessary, but the existing pavement was too narrow to accommodate the volume of current traffic. In numerous instances the pavement thickness was inadequate to carry the present loads, and the alignment was improper for the safety of the rapidly increasing high-speed traffic.

Repairs to pavements of adequate design for current traffic were made by the state's maintenance forces. It is the improvement, or "modernization," of those pavements that were found inadequate for current traffic that concerns us in this discussion.

During recent years the writer has had experience as contractor's super-

intendent on several projects in Texas involving the modernization of portland cement concrete pavement. Two of these will be taken as examples.

### —US 80 PROJECT

One was on US 80 in Hudspeth County, approximately 50 miles east of El Paso, and the other was on US 81 in Bexar County from San Antonio northeast toward Austin. These projects were different in subgrade soil conditions, climatic conditions affecting the service of the existing pavement, and the general character of the traffic.

Hudspeth County has an average annual rainfall of 9 inches, the majority of which falls in a few heavy showers of short duration. The pavement is not subjected to long wet seasons. Slab pumping did not exist to the extent of causing failure on this section of highway. The existence of cracked areas was so minor that the engineers did not consider it necessary to remove any of the existing

Presented at the Texas Asphalt Conference, Fort Worth, October 31, 1948.

★ Leveling course of 75 lb. per sq. yd. of hot mix being spread—Hudspeth County

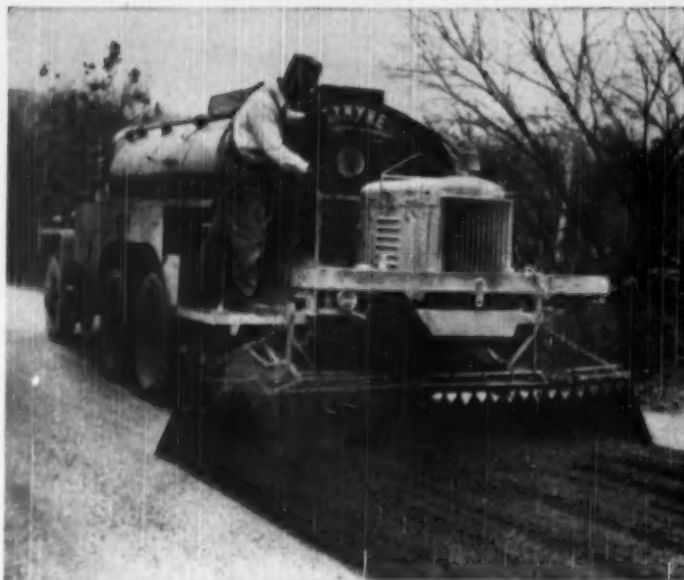
★ Windrow oven used to obtain uniform distribution of hot mix base widening material

★ Blading the windrow of hot mix asphaltic concrete into 3-ft widening trench

63



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pavement or provide any corrective measure. This project was designed primarily to provide more width, better the alignment and restore the riding surface. The existing pavement was 18 ft. in width and the alignment included several sharp curves that were not safe for current high-speed traffic.

The new design provided for widening to 24 ft. by the use of hot mix asphaltic concrete. The project was 18 miles in length. Approximately  $\frac{1}{2}$  of the project was widened 3 ft. on each side and  $\frac{1}{4}$  widened 6 ft. on one side, the latter necessitated by the nearness of an existing irrigation canal. The thickness of the widened section was 7 in., except in a few short areas of poor subgrade soil where the thickness was 9 in. A relocation section was constructed 24 ft. in width and 7 in. depth of hot-mix asphaltic concrete base course. The surface or redecking course consisted of 175 lb. per sq. yd. The surface course of 100 lb. per sq. yd. was placed with a finishing machine.

#### Special Widening Machines

Placing the 3-ft. widening section in layers and keeping the road open to traffic was the major construction problem. Two special equipment units were built for the operation. One was a windrow box that hooked on the truck and spread a uniform amount of pavement mixture on the outer edge of the existing pavement. A motor grader was then used to push the windrow into the prepared 3-ft. width subgrade. The other special equipment was a steel drag built on the principle of the old Wisconsin road drag that would spread the mixture to a uniform thickness and 3-ft. width. The earth shoulder was then bladed in against the outside edge and the conventional 3-wheel roller used to compact the course. There are now on the market specially designed spreaders and rollers considered more efficient than the shop-built equipment designed by the contractor for this job.

#### Planning Survey

The summer traffic count for this road was 1605 vehicles per day—a heavy volume, and high-speed traffic.

It was necessary to have at least four miles of subgrade for widening open at all times. This amount was necessary for the maximum daily output of the asphalt plant. One ton of material would spread a distance of 18 ft. for a  $3\frac{1}{2}$ -in. course; daily outputs were from 1,000 to 1,200 tons, which for a single course required approximately 200 stations for one day's run.

It is fairly easy to slow traffic down and control it for a very short distance, but a traveler enroute from the West Coast to the East is not going to hold his speed to a reasonable rate for four miles. The high-speed traffic caused constant fear of a serious accident. The project was completed without a single accident involving contractor's equipment or personnel. However, there were several instances of vehicles running off the edge of the 18-ft. slab and dropping the outside wheels into the widening excavation; one such accident involved serious injuries, but no damage claims.

#### Local Aggregates Used

A very interesting feature of the Hudspeth County project was the use of local aggregates for the hot mix asphaltic concrete. This is the only project that I have personal knowledge of being built where 100% of the standard specification aggregates were available in a single local source. Several projects have been built where the engineer designed and wrote his specifications for a special local material, but for the standard specification it usually requires an admixture of fine sand and in some cases a mineral dust. The local material available at the east end of the Hudspeth County project contained both fine sand sizes and minus 200 material in sufficient quantity to meet the standard specification.

A total of 46,305 tons of hot mix asphaltic concrete was used on the project, or an average of 2,600 tons per mile. The cost of the completed modernization was \$15,700 per mile.

#### II—US 81 JOB

The project on US Highway 81, San Antonio, was truly an interesting one, as it included almost everything in the category of highway construc-

tion. It included the extension of all small drainage structures and widening of one 430-ft. bridge; roadway excavation for 26-ft. width on each side of the existing concrete pavement; revision of the grade on over one-half mile of road which required removal of the concrete pavement; placing 8-in. compacted depth of crushed stone or caliche sub-base; asphalt prime coat on sub-base; hot mix asphaltic concrete binder or base course, level-up course and surface course; removal of broken slabs of pavement and replacing with new portland cement concrete; single asphalt surface treatment on shoulders; concrete curb; storm sewer inlets, and adjustments in sanitary sewer manholes.

The major task, however, was that of keeping the customers satisfied. The customers are the traveling public and the thousand-and-one roadside businesses who depend solely on the traveling public for existence. Not so many years ago when a contractor moved in on a job he could barricade each end of his project and send the traffic around over lengthy and usually dusty and rough detours. "Those days are gone forever" so far as the majority of the road modernizing projects are concerned. The traveling public and the roadside merchants demand that speed and business go on as usual during road reconstruction.

#### 9,000 Vehicles Daily

The Texas Planning Survey made a traffic count during the job. The average daily count on the San Antonio end was 10,070 vehicles, while on the opposite end, it was 7,640, or an average of approximately 9,000 vehicles per 24 hours. Peak periods were probably 900 to 1,000 vehicles per hour. Traffic was so heavy at times that a workman would have to wait three minutes to cross the road.

The project was completed without a single major accident. Only three damage claims were filed for a total of less than \$200, and investigation showed that in all three cases the drivers were violating state traffic laws.

A few well-worded and well-placed signs to warn and guide traffic are much more effective than a large num-

★ Shop-built spreading machine used for spreading the hot mix base widening material to a uniform thickness and width—Hudspeth County

★ Completed section of the new 24-ft. width roadway—Hudspeth County





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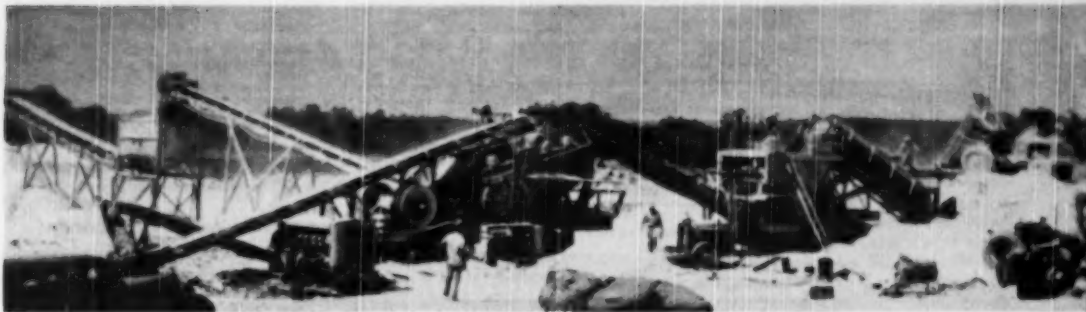
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★ Crushing and screening plant processing local material for crushed limestone sub-base widening—Bexar County job

ber of ill-placed signs. A large number of signs and barricades are confusing to the traffic and a detriment to the progress of the work. Short, 8-ft.-paneled, movable barricades and metal flags surfaced with Scotch-lite reflectorizing material are very effective for both day and night traffic control.

See the figure (typical section US Highway 81 north of San Antonio) for design details. The existing pavement consisted of 9-6-9 p.c. concrete 20 ft. wide with a temporary surfaced shoulder 10 ft. wide on each side. Shoulders were built by maintenance forces several years ago to provide additional traffic width. The p.c. concrete had been underseal two years ago. No attempt was made during the present modernization work to salvage any part of the existing shoulder material as it was not of standard quality.

Prior to beginning the modernization project, the engineers took elevations of the center line and each edge of old pavement and from these elevations established the finished grade for the new work. The sub-grade for the specified 8-in. crushed limestone base course was built to a grade established from the finished grade. Also, the surface of this base course was finished to established "blue-tops." The two 3-in. courses of hot mix asphaltic concrete binder were placed with a bituminous paver.

The inside edge of the binder course was feathered out over the concrete pavement. This accomplished two purposes. A seal was provided over the longitudinal joint between the old concrete and the asphaltic concrete binder course, which prevented storm water during construction from passing down through the joint to the sub-grade. This feathering also was a safety feature during construction, as

it was necessary to allow traffic on the binder course on one side, and on the old concrete pavement during work on the opposite side. It is also considered quite likely that the lapping of the binder course over the edge of the old pavement will reduce the possibility of a crack developing at that point.

#### Surface Course Sequence

After completion of the hot mix asphaltic concrete binder course on both sides, the hot mix asphaltic concrete level-up course was placed over the old pavement. This course varied in depth from 1 to 6 in., the average being  $3\frac{1}{4}$  in., and was generally placed in two layers, using a motor grader. The edges of the binder courses automatically established the grade for the leveling course, and it was very easy to secure a uniform true cross-section to the surface of the leveling.

After completion of leveling, a 1-in. hot mix asphaltic concrete surface course was placed using a bituminous paver. As the work was accomplished under traffic, the following sequence was used in placing the surface course.

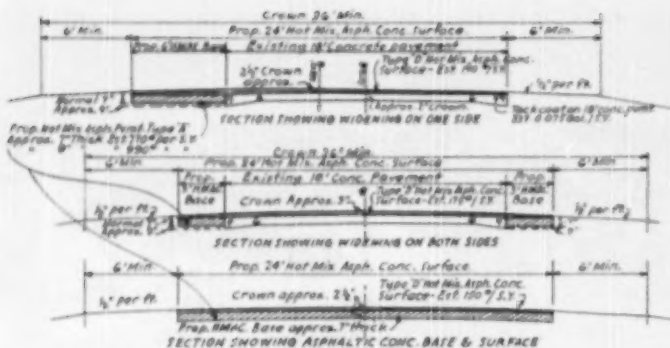
A 12-ft.-wide strip was first placed down the center while traffic passed on each side. Then, this strip and one side were used by traffic while two 10-ft. strips were placed on the other side. Upon completion of one side, the traffic was moved to the completed side while the two 10-ft. strips were placed on the remaining side.

Upon completion of the hot mix asphaltic concrete work, crushed stone shoulders were placed and surfaced with a single asphalt surface treatment for a width of 5 ft. on each shoulder.

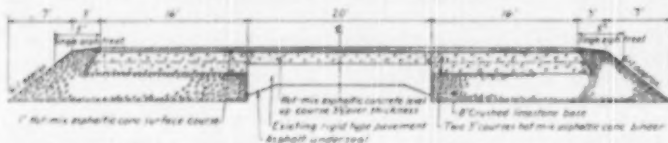
A one-half-mile section on which the grade was revised was constructed in half widths. See pictures showing



★ "Before and After." Showing the old 20-ft. p.c. pavement and 10-ft. asphaltic surface treated shoulders prior to widening and resurfacing; and the new 52-ft. four-lane roadway after widening and resurfacing were completed



★ Typical cross-section for US 80 widening in Hudspeth County, Texas



★ Hot mix asphalt concrete widening and resurfacing U.S. Highway 81 north of San Antonio, Texas

work in progress. After the pavement had been broken into small pieces and the reinforcing steel removed, the old concrete was removed and used with the excavation for constructing the embankment. Standard earth-moving equipment performed this work and no major problems were encountered.

#### Material Sources

A local source of limestone gravel was obtained by the contractor on the Salado Creek mid-point on the project. This material was processed by washing, crushing and screening it

into the desired sizes. This source did not provide material that would meet the entire gradation as specified. A local fine field sand was obtained from a source 22 miles distant, and commercial limestone screenings were obtained within truck-haul distance.

The project required a total of 42,500 tons of hot mix asphaltic concrete. Of this quantity 25,400 tons was base or binder course on a crushed caliche sub-base, 7,000 tons was a binder course over the existing pavement, and 10,000 tons of surface course.

88

★ Upper Left: Grade line revisions were made by reducing sharp vertical curves to tangent grade, except at each end of grade change where long vertical curves with ample sight distances were constructed. The cuts, fills, sub-base and 6-in. hot mix binder course were completed on half width section while traffic was carried on the remaining half of the old road. (Right): Placing first 3-in. depth of hot mix binder course through cut section of grade line revision.

Lower Left: Placing 6-in. hot mix binder course through cut section, showing half width of old roadway and shoulder, which carried traffic until the binder course was completed on revised grade line. Right: Traffic was diverted on to new base, at left, then old pavement removed at right and this side graded and paved; completed modernization shown.

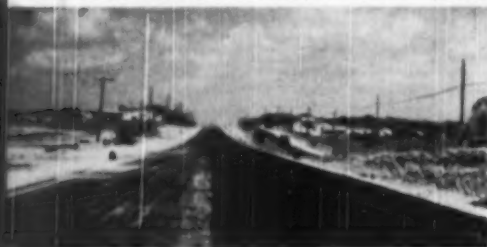
A distribution of the cost of the project is:

Grading and extension of small structures	12% -- \$ 14,000	per mile
Extending large structure	18% -- 22,000	" "
Flexible sub-base	19% -- 23,000	" "
Asphaltic concrete pavement	48% -- 56,000	" "
Miscellaneous, such as concrete curbs, etc.	3% -- 4,000	" "
Total cost per mile	\$117,000	per mile

#### The Job in Perspective

Roadside business adjacent to this highway is so intensive that additional width of right-of-way was not practicable and the improvement was made on the existing width of 120 ft. This improvement is considered "the latest thing" in highway modernization. However, we must not lose sight of the fact that the old structures we have just modernized was "the latest thing" only a few years ago. In modernizing today the highways of yesterday, we must keep in mind the modernization of tomorrow. The designer of this project truly must have had tomorrow in mind. This highway is currently passing from the suburban to the urban and the next modernization will be to a curbed section with the necessary drainage facilities. An examination of the typical cross-section of the current modernization project reveals how economically the present modernization structure will fit into the modernization project of tomorrow.

There are a few basic principles worthy of note that are fundamentals in modernizing a highway. In modernizing an existing concrete pavement too much emphasis cannot be placed on re-conditioning the existing



pavement before widening and re-decking. Re-conditioning includes an asphalt underseal, removal of broken sections of the slab that are "rockers" and replacement with new pavement and the removal of any excess crack sealing asphalt from the surface or joints of the pavement.

Numerous and excellent articles have appeared in technical magazines and periodicals during recent years on asphalt underseal work, and the details of this work will not be taken up here. In most instances, Texas has let separate contracts for underseal work which is completed prior to letting the contract for the modernization.

After removal of the concrete in the small broken slab areas, two methods of replacing the pavement have been used: one is to replace with new portland cement concrete and the other is by use of asphaltic concrete of the type required in other parts of the work.

There is quite a difference in the opinion of engineers as to the extent the crack sealing asphalt should be removed from the old pavement prior to placing the asphaltic concrete re-decking. Usually one of the extremes prevails—either none is removed, or every speck of asphalt, together with all of the joint sealing asphalt, is removed. A "middle of the road" policy is recommended. Remove all surplus asphalt that is likely to come through the re-decking course. That portion of the sealing asphalt in the joints that is below the surface is a benefit to the re-decking course. The majority of the joints and cracks in the old pavement will open up through a thin re-decking course. The maintenance forces then pour these cracks and have an excess of sealing asphalt on the surface of the new course. Why not leave the old sealing asphalt in the joint which will act as an underseal to the re-decking course and seal the crack from the bottom?

This paper would not be complete without giving recognition to the excellent cooperation between the engi-

neers and contractor on the two projects described. The Hudspeth County project was built under the direction of P. S. Bailey, district engineer of the Texas Highway Department, and L. E. Wood, senior resident engineer. The U.S. Highway 81 project, near San Antonio, was under the supervision of F. S. Maddox, district engineer at San Antonio, and B. C. Jenkins, senior resident engineer.

### Low Cost Airport for a Small Community

(Continued from page 81)

trate of soda per acre were applied.

The grass mixture specified consisted of 10 and 15 lb. per acre, respectively, of Carpet grass and unhulled Bermuda grass, sown by hand, plus a nurse crop of grain rye or Victory grain oats at 1½ bushels per acre; tillage depth was 2 in., accomplished by discing. Immediately following seeding, the soil was compacted with a Cultipactor.

Within five weeks a healthy turf development had made a start. Some washing occurred during rains, as was expected, and there was minor evidence of seed concentration due to washing. But the results were judged to be very satisfactory for this fine sand, which is so unstable that 10% slopes on highway work will erode badly when left unprotected.

Medium intensity Westinghouse landing lights were installed along runways at intervals of about 200 ft. The cost of the project including clearing and grubbing of light growth, drainage, placing of two runways with local sand and RC-3, light surface treatment, turf development, and installation of landing lights, and finishing up, was about \$120,000.

Sverdrup & Parcel, consulting engineers, St. Louis, Mo., designed the field, and Cherokee Engineers, of Macon, Ga., supervised construction. Contractor for the job was the Seaboard Construction Co., of Brunswick; H. J. Friedman, president. The Brunswick Airport was a CAA proj-

ect under the Atlanta district office of the Civil Aeronautics Administration.

### Cover Scenes for Bituminous Roads and Streets

Final stages of modifying existing facilities were recently completed on US 25 (Dixie Highway) between Bowling Green and Toledo. A previous article appeared in Feb. '48 *ROADS AND STREETS* showing details of equipment and methods used in this construction.

The full adaptation of existing pavements to meet changing conditions is well illustrated by this improvement. In general, it has consisted of construction of new macadam base courses paralleling the old pavement with variable median strips between the old and the new. The new macadam was surfaced with asphaltic concrete. Traffic was carried on the old paralleling lanes during construction of the new. The old 18-ft. pavement was then widened to 22 ft. and resurfaced with asphaltic concrete. The area through which this project extends is very flat and for that reason the grade of the original pavement was essentially to new standards.

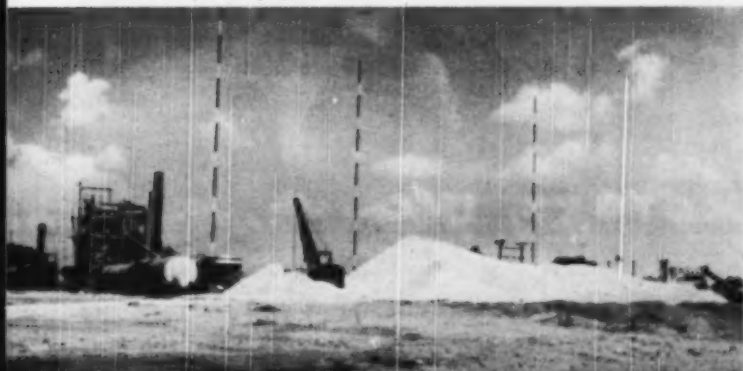
The various contracts necessary to accomplish this transition have been carried out by the Ohio department of highways. T. J. Kauer is director; L. H. Wismar, chief engineer construction; George M. Lieber, division engineer, and E. B. Baur, division construction engineer. The contractor for recent projects has been the S. E. Johnson Co. of Toledo, Ohio with John Fisher as superintendent.

### Next Highway Research Board Meeting

The 30th Annual Meeting of the Highway Research Board of the National Research Council will be held in Washington, D. C. from Jan. 8 to Jan. 12, 1951. Headquarters will be the building of the National Academy of Sciences. Program plans are well underway and an outstanding program of papers and reports on highway research subjects is assured. Details will be announced at a later date. The change from the Board's usual December meeting dates is necessary to avoid conflict with other important meetings involving highway engineers and administrators which are scheduled for December, 1950.

When your workers perform servicing and inspection of dump trucks while bed is hoisted up—do you have that post or block safely in position? A hoist can fall when least expected.

★ Hot mix plant and aggregate processing plant set up at source of local material midway on the project



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*Stop that waste!*

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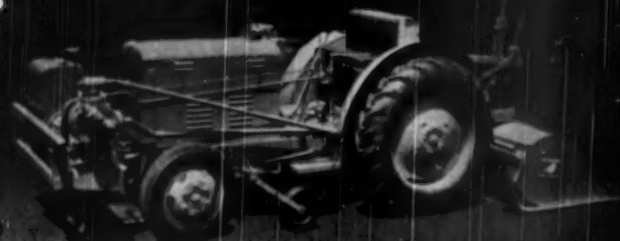
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So, do your mixing with a SEAMAN. Stop the waste that robs new construction funds.

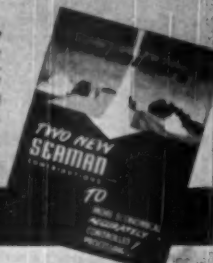


NEW SEAMAN Self-Propelled TRAV-L-PLANT. Mixing width: 7 ft. Gas or Diesel powered. Equipped with spray bar, pump, pump tachometer, and tachometer wheel. For bitump or water.



NEW SEAMAN Self-Propelled MIXER. Mixing width: 7 ft. Gas or Diesel powered.

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# Design of Seal Coats and Surface Treatments

By

**F. N. Hveem,**

Materials and Research Engineer

**W. H. Lovering,**

District Materials Engineer

**G. B. Sherman,**

Associate Highway Engineer  
California Division of Highways

IT HAS BEEN apparent for a number of years that the methods commonly employed for estimating the quantity of asphalt and screenings and to control the placing of seal coats are not adequate to insure that satisfactory results will be consistently obtained.

Up to the present time, the accomplishment of a successful seal coat has depended upon skill and experience on the part of the engineer, the availability of suitable equipment and materials and above all upon good weather. As a result of rapid expansion in the California highway program, it is increasingly difficult to find experienced men for all of the numerous cases where seal coat construction is involved. The problem has been recognized for several years and the materials and research department has been engaged in collecting information, making observations on current practice and as opportunity has permitted, has studied the problem involved in the designing and placing of seal coats on road surfaces.

## Pertinent Discussion

In a recent paper entitled "The Use and Abuse of Seal Coats," C. V. Kiefer, 1) Pacific Coast Division, Asphalt Institute, presented a timely discussion on the subject. [Feb. '50 ROADS & STREETS.]

The purpose of this article is to describe the problem, to point out some of the factors involved and to outline the first steps of a definite engineering approach. While complete field data are lacking to support all of the conclusions and inferences drawn, nevertheless, it is believed that a start can be made and as more information becomes available, procedures can be adjusted or modified as found to be necessary. In any event, the field engineer or maintenance superintendent

should be furnished with an orderly and logical procedure in order that the essential details of seal coat construction can be handled with greater assurance than is possible at present.

As in the case of all bituminous road surfaces, seal coats are made up of two ingredients; namely a bituminous binder and stone chips or screenings. While the ingredients are relatively commonplace and simple, nevertheless, there are many variations in properties of both asphalt and stone and it is proposed to discuss some of these variations.

Before we can decide what is important and what is relatively unimportant, it is necessary to recognize the purpose for which a seal coat is being placed. The term "seal coat" implies

that the original intent of this type of construction was to seal the road surface; that is, to prevent surface water from penetrating the pavement or base. However, all highway engineers will recognize that a surface treatment of asphalt and screenings may be applied to a road to accomplish one or more distinct purposes.

These may be enumerated as follows in approximate order of importance:

1. To seal the road surface against the entrance of moisture or air.
2. To develop a non-skid texture where the existing road surface is dangerously smooth and slippery.
3. To apply a fresh coat of asphalt which will *enliven* an existing dry or weathered surface and thus improve wear resistance.

## Relationship or Influence of All Factors in Choice and Performance of Screening



FIG. 1

Published in July-August, 1949, California Highways and Public Works.

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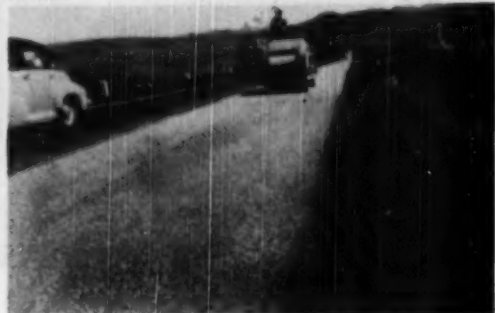
★ Distributor truck starting spread of asphalt



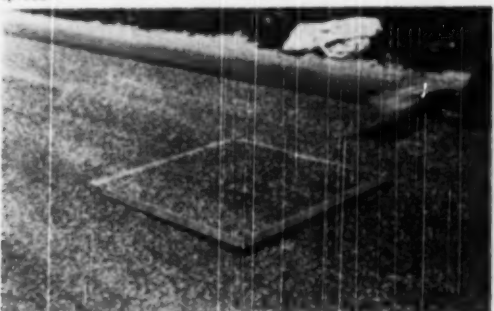
★ Freshly applied asphalt immediately following passage of distributor



★ Screenings being applied to the surface with a mechanical spreader



★ Screenings being rolled with a tandem roller



★ A tray representing one square yard placed on pavement to determine uniformity of distribution of screening spreader



★ A newly completed seal coat

4. To reinforce and build up an inadequate pavement section.

5. To provide a demarcation for traffic guidance between shoulder sections and traffic lanes.

6. To improve luminosity or visibility at night.

#### California Method

The choice of asphalt binder, the number of layers and size of screenings can only be selected intelligently if the engineer has a clear conception of the purpose in each particular case.

A seal coat may consist of one or more successive layers of bituminous binder and screenings but in the majority of cases, at least in California, a seal coat consists of one application

of asphalt on the existing surface and a single application of screenings. The Standard Specifications for the California Division of Highways list under "Seal Coats": Class "A-Medium," Class "A-Fine," Class "B-Single," Class "C-Coarse," Class "C-Medium" and Class "C-Fine," all of which involve a single application of liquid asphalt covered with one layer of screenings. There are of course the two layer seals such as Class "B-Double" and Class "C-Double."

An analysis chart, Fig. 1, has been prepared in order to classify the factors that are involved when selecting the type and quantity of screenings. The breakdown shown in Fig. 1 was made in order to indicate the factors

which bear upon the quality of screenings, those which should be taken into account when deciding upon the size and also the variables that will influence the quantity required, particularly on a tonnage basis. These primary items of quality, size and quantity were selected because each ought to be considered in preparing an adequate set of specifications and must also be recognized by the engineer in charge of construction who wishes to secure a satisfactory job.

#### Items in Figure 1

First the question: What do we mean when we say screenings must be of good quality? Common experience indicates that many types of stone that



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are durable, properly graded and clean and with the proper surface characteristics, will be satisfactory for the manufacture of screenings, and it does not seem to be important whether the screenings are in the form of crushed rock, screened gravel or crushed gravel. Good results have been obtained using any of these types. However, it is evident that all types of stone are not necessarily used in equal amounts and also the appearance of the seal coat surface texture will vary depending upon type of aggregate.

It is important that the screenings have the ability to retain a film of asphalt in the presence of water; the asphalt must wet the stone and not strip off when subjected to rain or ground water. Mineral aggregates from which asphalt can be stripped by the action of water are commonly called "hydrophilic," meaning that the aggregate has an "affinity" for water. Stone particles that hold asphalt tenaciously even when subjected to water action are called "hydrophobic," meaning that they avoid water. The question of adhesion affinities is ordinarily indicated by film stripping tests performed in the laboratory. Certain commercial additives or anti-stripping agents are being sold or proposed for use with the intent of improving the adhesion and thus permit the use of aggregates that otherwise would strip and be unsuitable. So far, these additives have not proved to be universally successful. A number of proprie-

# CHART FOR ESTIMATING THE QUANTITY OF SCREENINGS TO BE APPLIED FOR SEAL COAT CONSTRUCTION

## Information Required

Maximum effective size of screenings and weight per cu ft.

Proceed in clockwise direction

First quadrant determines volume of screenings.

Curve A-Net amount which will adhere to road surface.

Curve B-Net amount plus 10%.

Curve C-Net amount plus 20%.

Second quadrant converts volume to pounds per sq. yd.

Third quadrant indicates total quantity required per station.

TONS OF SCREENINGS PER STATION

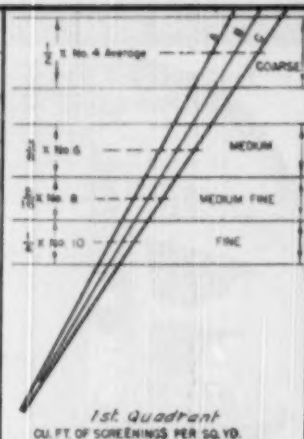
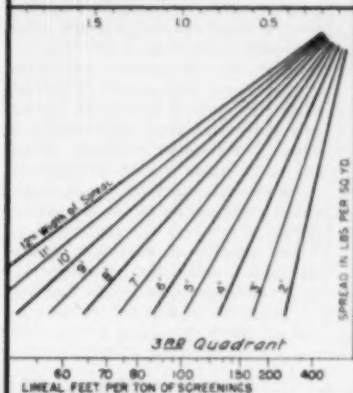
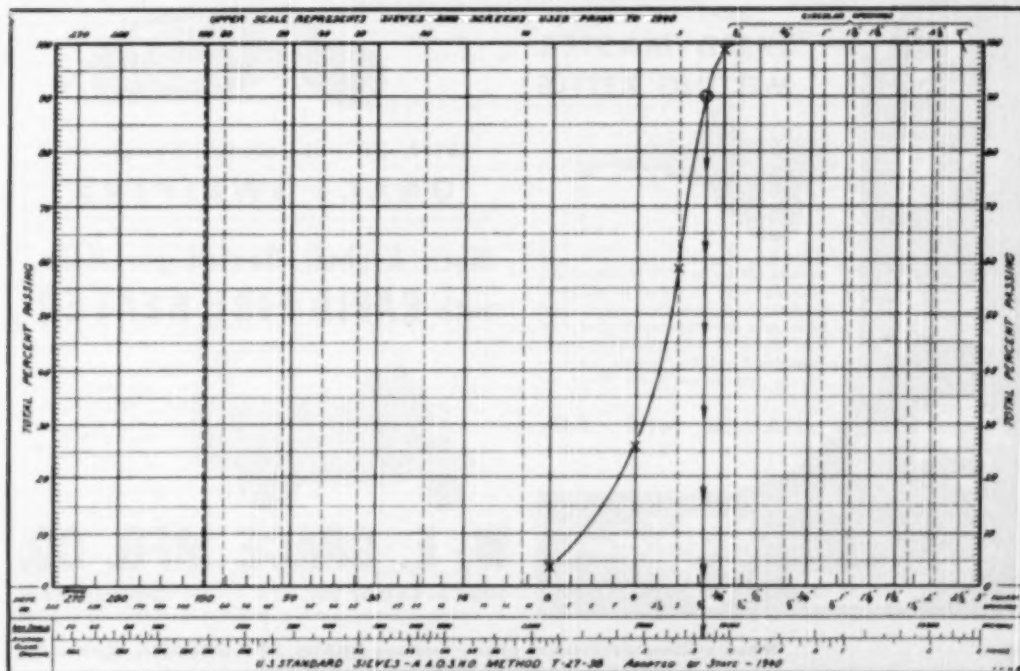
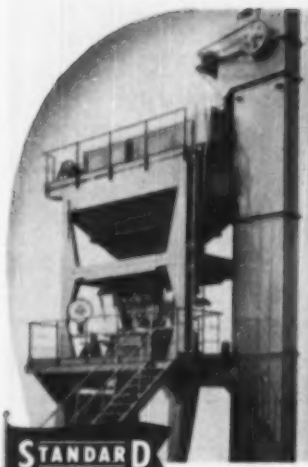


Fig. 2

Fig. 3

## SEMI-LOG CHART FOR GRADING CURVES





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tary compounds are available, but in California practice a selection is made only after laboratory tests have indicated that a certain additive will improve the aggregate in question.

### Porosity of Stone Particles

The porosity of the stone particles will have an effect upon the amount of oil or asphalt that will be taken up and the surface roughness may also have an influence. However, the question of surface coatings is probably the most serious and the surface films of dust, clay or moisture on the screenings have been responsible for a great many failures in seal coat construction. Like many other factors, these matters are relative, and damp aggregate may cause no trouble when the work is completed and properly cured or conditioned during warm weather. However, the same amount of moisture in the stone may result in failure when the work is carried on during cold weather or when the humidity is high. The weather condition during the construction period undoubtedly represents the most important single factor contributing to the success or failure of this type of construction.

The question of durability is primarily a problem for laboratory determination and need not be detailed.

Uniformity is achieved by the control of plant operations and by effi-

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PORTABLE AND STATIONARY  
High Production—Low Cost



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cient operation of the screening facilities.

The second factor in Fig. 1 relates to selection of size of screenings. In selecting, the planning engineer must consider such questions as smoothness of the surface desired, whether or not consideration is given to the irritating noise or rumble in cars and the question of tire wear as well as that of providing an enduring non-skid surface. In order to make an intelligent selection of screening size, the engineer must give consideration to the primary reasons for placing the particular seal coat, referring to the six distinct purposes listed. It is evident



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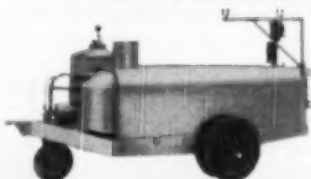
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that stone size will depend largely on reasons for placing the "seal coat."

At the present time, the choice of screenings for a single course construction on the state highway system generally involves consideration of only two sizes; namely, the *Medium* screenings having a nominal maximum size of  $\frac{1}{2}$  in. and the *Medium Fine* in which 90 to 100% will pass a 5/16 in. screen. Finer screenings have proved troublesome to spread and it is difficult to prevent "padding," or a wavy surface. Coarse screenings of  $\frac{1}{2}$  in. max. have been found to develop a noisy, uncomfortable surface texture and they are undoubtedly responsible for increased tire wear.

The third primary factor is quantity. In the past, inaccuracy in estimating quantities have not usually been responsible for failures. The principal errors have resulted in providing an excessive amount of screenings, which means waste and needless expense. Work in the laboratory of the division of highways has followed the lines originally laid down by Hanson in New Zealand, (2), who established the fact that regardless of the amount of screenings placed over a given application of oil, the final layer that adheres would be only one stone in thickness. A series of investigations carried out in California have tended to verify the findings of Hanson. It has been found, for example, that a maximum of 18 lb. per sq. yd. of screenings represented an excellent coverage on the road using  $\frac{1}{2}$  in. x No. 6 screenings. Experiments in the laboratory indicated that for this size of screenings, 18 lb. per sq. yd. represented a layer one stone thick.

### Hanson's Conclusions

Hanson also concluded that for conditions in New Zealand it was necessary to make an allowance of about 10% extra material because methods of spreading were not 100% perfect and there is a certain amount of loss or "whip off" that occurs when the new surface is subjected to traffic. Under average conditions prevailing during construction in California, it is probable that an estimate of 20% allowance is justifiable. The proper allowance for "whip off" should be based upon the type of spreading equipment and perhaps upon the speed and volume of traffic.

Studies conducted by one of the authors, W. R. Lovering (formerly of headquarters laboratory and now materials engineer in District I, Eureka, established a relationship between the effective maximum size of screenings and the volume of the same screenings which would produce a layer one stone thick. Hanson established a cor-

## Relationship or Influence of All Factors That May Affect Choice and Performance of Bituminous Binder

(Assuming Bituminous Binder of Suitable Quality)

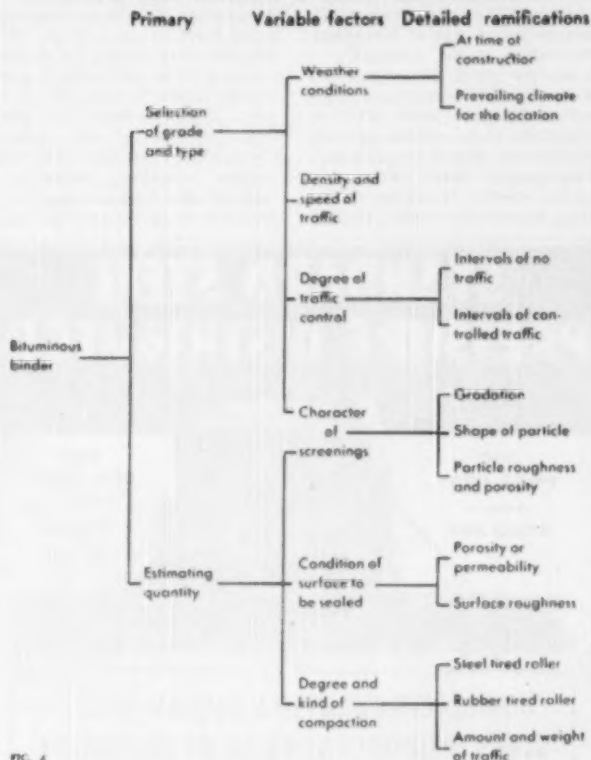


FIG. 4

relation between the average least diameter of the stone and the quantity of screenings required for coverage. This average least diameter was determined by caliper measurement which is hardly feasible with the screening sizes commonly used in California and an attempt was made to determine a more practical correlation.

A relationship was established between the "effective maximum size" and the loose volume of the same screenings which would produce a layer one stone thick as long as closely sized screenings containing no appreciable overrun in the fine sizes were used. The effective maximum size is determined as the theoretical sieve size in inches which would allow 90% of the screenings to pass through the openings. Better correlation was obtained between the "spread modulus" and the loose volume of the same screenings required to produce a layer one stone thick. The spread modulus may be defined as the weighted aver-

age of the mean size of the largest 20%, the middle 60%, and the smallest 20% of the screenings as determined from a plot of the grading curve. Screenings from different sources gave somewhat different values, however, indicating that all variables had not been considered. Probably the most important of the variables not evaluated are the character of the surfaces of the rock and the shape of the rock particles.

### Quantity of Screenings

It is felt however, that the use of the effective maximum size will give sufficiently accurate results considering present limitations of construction methods and equipment, provided the other factors are kept in mind. On the basis of the foregoing, a chart, Fig. 2, has been prepared as an aid in estimating the quantity of any size screenings required. This chart provides an adjustment for the size of screenings with an allowance for either 10%

or 20% "whip off." A correction factor for the variations in weight per cubic foot and a final conversion to the number of tons required per station for different widths of spread is provided. It is also possible to compute the number of lineal feet which would be covered by one ton of screenings for the various widths of spread.

To use the chart, two determinations must be made or two items of information must be on hand. First, a sieve analysis of the screenings must be obtained and plotted on a standard semi-log grading chart. From this curve, the effective maximum size in inches is determined by noting the size

in inches on the bottom scale that corresponds to the point where the plotted graph crosses the line representing 90 percent passing. Fig. 3.

The grading chart, Fig. 3, gives an illustration showing a typical curve for a sample of medium screenings of nominal size  $\frac{1}{2}$  in. x No. 6. In this case the curve crosses the 90 percent line at a point equivalent to a hypothetical screen having 0.32 in. openings. This represents the effective maximum size of the screenings. Chart, Fig. 2, lists the standard specification screenings indicating the range of effective maximum size. The second item of information required

is the loose weight per cubic foot of the particular screenings in question. Having the effective maximum size and the weight per cubic foot, the number of pounds of screenings required to cover one square yard can be determined from the chart.

### Selection and Application of Bituminous Binder

Any bituminous material, whether asphalt or tar, that is suitable for sticking rock particles to the road surface must have certain properties. For seal coat construction, a bitumen should have good adhesion to the existing road surface and to the screenings. It should develop sufficient cohesive strength to hold the screenings in place and should develop this strength rapidly in order to prevent loss of screenings under traffic. The bituminous binder should be able to resist deterioration under conditions of outdoor exposure and not become hard or brittle for a substantial period of time. In addition, the bitumen should have the proper fluidity or consistency to permit ready and accurate application. As the conditions vary between projects, it is evident that no one grade of liquid asphalt will satisfy all of the requirements for every project considering the wide variety of conditions of the existing road surface, type of screenings, equipment available and climatic conditions which may be encountered in California.

While the selection of the proper grade and type of asphalt can be a complex problem, it is often further complicated by the individual likes, and dislikes, of engineers. Few engineers have a philosophical attitude towards a poor job and it is only natural that if a certain project turns out badly, the engineer understandably takes a dim view of everything connected with the unlovely result, and it often happens that the particular type or grade of asphalt involved is blamed and condemned for all future use.

In order for a bituminous binder to hold screenings on the road surface, it must adhere to the screenings and develop at least a minimum degree of cohesive strength. In the case of liquid asphalts, this cohesion is developed by evaporation and to some extent by oxidation. The rate of evaporation is controlled by the temperature of the liquid, the amount and type of volatile constituents, temperature of the air, humidity, air movement and by the amount of exposed surface.

In the case of seal coats, the temperature of the asphalt is determined by the temperature of the pavement to which the binder is applied. The pavement temperature will, of course, depend somewhat upon the recent air

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temperature and will be definitely influenced by the ability to absorb heat directly as a result of radiation from the sun. Thus, it is generally true that liquid asphalt applied in the summer months when the days are long and temperatures are high will reach the desired consistency in a reasonable period of time. During the fall months, with shorter days and lower temperatures this interval can become greatly extended depending upon weather conditions. However, it is also true that hot weather may cause loss of screenings because the asphalt is too soft. For example, ROMC Cutbacks have been observed to give good results in late summer or early fall but were not satisfactory in hot weather as the asphalt was too fluid because of the high temperature and still did not set up fast enough to hold screenings.

#### Weather Condition Factor

A chart, Fig. 4, has been prepared to show the factors that bear upon the selection of the grade and type of bituminous binder and includes the variables which should influence an estimate of the quantity required. The chart indicates that the prevailing weather condition is one factor having an influence upon the choice of asphalt. For example, it could be expected that a rapid curing cutback, RC-5, will set up or gain in consistency at a faster rate than RORC-5.

While this latter product contains a volatile solvent, the base asphalt contains a larger percentage of oily constituents. Thus, it might appear that the RC-5 would be preferable in cold weather work. However, the question of brittleness intervenes as a base stock of an RC-5 is 85-100 pen. asphalt and ordinarily could be expected to reach the brittle point due to weathering in a shorter period of time. The best solution, of course, is to avoid placing seal coats or any other bituminous construction under adverse weather conditions. It has been suggested that a substitute treatment might be employed in the form of a light application of open-graded plant mix placed upon a heavy tack-coat in lieu of the orthodox seal coat when weather conditions are liable to be unfavorable.

Aside from durability reasons, the density of traffic to be carried is a factor. With increase in traffic and average vehicle speed, the problem of closing a road to traffic becomes more difficult. While it is essential that traffic be kept off the road until the asphalt reaches a consistency which will hold the stone chips in place, the setting time required will vary depending upon the type and grade of asphalt as well as the prevailing weather.

er. This indicates the importance of using a rapid setting binder when construction must be carried on in the late fall.

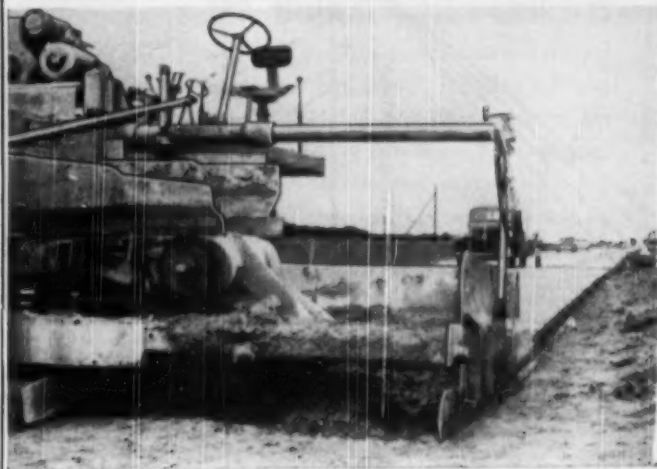
The lower portion of the chart, Fig. 4, lists factors which have an influence upon the quantities of bituminous binder. These factors are the character of the screenings, the condition of the existing road surface, also the degree and kind of compaction to which screenings will be subjected.

Under the heading "Character of Screenings" is included such things as particle gradation, particle shape, particle roughness and porosity. The gradation or sieve analysis of the screenings is an index to the amount

of voids which must ultimately be filled with asphalt. The particle shape, that is, whether the stone chips are relatively cubical or flat, will also have an influence on the void space. Particle roughness and porosity will take up additional oil compared to normal screenings. Hanson pointed out that the amount of asphalt should range from 0.5 to 0.7 of the voids in the aggregate as compacted on the road.

While sieve analyses are easily made and the surface capacity of the stone due to roughness and porosity can be evaluated by noting the amount of light lubricating oil that will be retained by the screenings when drained under standard conditions (4), the

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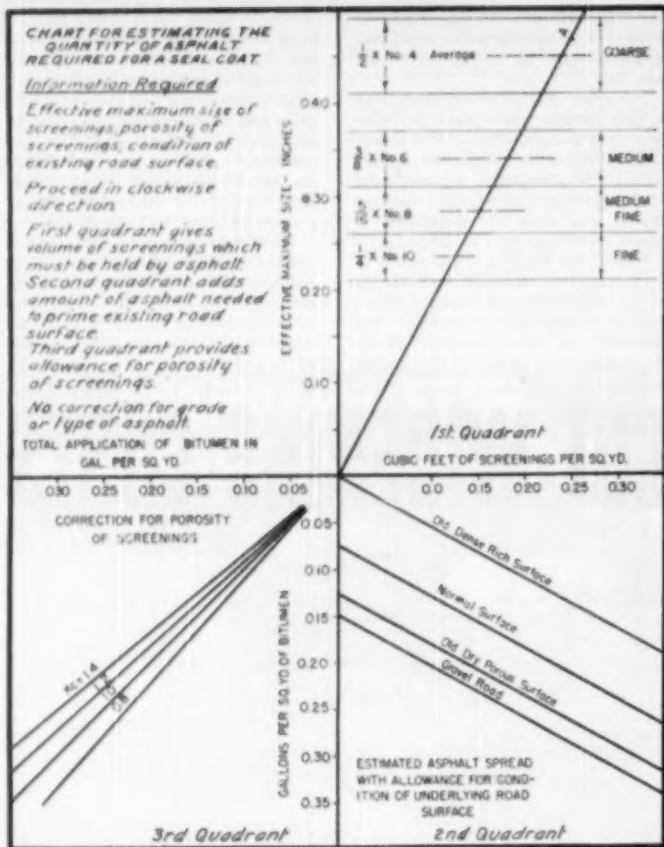


Fig. 5

factor of particle shape or cubicity is less easy to evaluate. Hanson (2), recognized the effect of cubicity in the screenings and proposed that the least dimension of individual rocks of a representative sample should be measured. Hanson averaged the least dimension of a number of particles and estimated the amount of oil from this average value. However, Hanson was dealing largely with coarse stone ranging from  $\frac{1}{4}$  in. to  $\frac{3}{4}$  in. size and as stated above his method of measuring individual particles by means of calipers does not seem practicable for the smaller sized screenings now used in California.

A method having better possibilities was developed by Egberto F. Tagle (3) of Argentina. This procedure involved the use of slotted screens which provide a particle size analysis based upon least dimension rather than upon maximum size of the rock particle. By comparing this type of grading analysis to the grading produced by standard screens, Tagle derived a factor which he designated the "cubicity fac-

tor" and the quantity of oil recommended in Argentine practice was based upon this factor. They also consider that "cubical" shaped particles are most satisfactory.

In the design chart, Fig. 5, the quantity of oil to be applied is based upon the maximum effective size of the screenings derived from a standard sieve analysis rather than upon the cubicity or average least dimension. This method has been selected because it is at the present moment more applicable than are the procedures proposed by either Tagle or Hanson.

The particle roughness and porosity can be determined by methods described in connection with the Centrifuge Kerosene Equivalent Test for establishing the surface factor  $K_s$  (4). The design chart, Fig. 5, carries an allowance for porosity of the stone in the third quadrant of the chart. (The factor  $K_s$  may be determined by measuring the amount of No. 10 lubricating oil retained by the screenings after they have been soaked in the oil and then drained under controlled temper-

ature conditions.)

In considering a correction for porosity using the factor  $K_s$ , it must be pointed out that this correction represents the amount of oil that will ultimately be absorbed by the screenings and the rate of absorption will depend upon the consistency of the bituminous binder which, in turn, is a function of temperature. As the temperature of an asphalt film in any sort of road mix or penetration treatment is controlled entirely by the temperature of the road surface or the aggregate, it is evident that absorption may take place very slowly when the road surface is cold and as a result the asphalt applied to compensate for absorbent aggregates may appear to be excessive and bleeding may develop before the excess is absorbed. However, at some future time when the pavement temperature rises, the oil may be absorbed and if a sufficient quantity is not applied in the first instance the absorption may leave an insufficient amount to hold the screenings in place. Therefore, it appears that screenings composed of highly porous stone will be particularly unsuited for cold weather work. It is not the intent to suggest that the ultimate amount of asphalt be applied during cold weather for a seal using porous aggregate. The inevitable result would be that sand would be applied to take up the apparent excess and the surface would dry out sooner or later. It is probable that the best solution is to avoid porous aggregates when possible.

Chart, Fig. 5, includes a correction for the porosity of the old road surface and it should again be emphasized that weather conditions and the presence of moisture may have a definite influence on the rate oil is absorbed.

### Summary of Factors

To summarize, it is recognized that the quantity of screenings required to cover the road surface will vary depending upon the size of the screenings and hence, the dimensions of the stone. Thus, a greater weight in volume of screenings will be required to develop a coverage of  $\frac{1}{4}$  inch screenings than will be required if  $\frac{3}{4}$  inch size is used. As the screenings vary in weight per cubic foot, a correction must be made in the number of pounds per square yard or the number of tons per station to compensate for variations in the volume-weight relationship. The amount of asphalt required is a function of the voids existing in the layer of screenings applied to the road. The total application of asphalt is also influenced by the amount necessary to prime the existing road surface which means that the existing surface must be evaluated in order to determine how

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much of the application will be taken up as a prime. Finally, there will be some variability when the screenings are definitely porous. The correct evaluation of these variables will permit an accurate estimate of the rate of application and the total quantity of asphalt required.

A casual survey of California practice indicates that the selection of asphalts for seal coat purposes revolves around the SC-6 grade. SC-6 or asphalts of 200-300 pen. have proved to be very satisfactory. However, in many cases the asphalt distributor could not be controlled in order to apply the amount desired. The quantity

of SC-6 could not be cut down to the desired rate without causing skipping or streaking of the sprays. For this reason, the base asphalt has often been diluted with solvents and many projects have been constructed with MC-3, 4 or 5, or with ROMC-3, 4 or 5, all of which represent blends of soft asphalt and a kerosene type of cutter stock.

In order to avoid loss of screenings due to the slow setting of kerosene cutbacks, RC types have been preferred in many quarters. However, the standard grades of rapid curing cutbacks are manufactured from base stock of 85-100 pen. asphalt and in order to have the advantage of a softer

base asphalt, a special grade of cutback is listed in the California Standard Specifications and designated as RORC-5 consisting of 200-300 pen. asphalt cutback with a small amount of naphtha solvent.

### Emulsified Asphalt

Another method for reducing the viscosity and thus permitting light applications to be made with a high degree of uniformity is the use of emulsified asphalt. A great deal of satisfactory seal coat construction has been accomplished by the use of emulsions. From evidence now available, it does not appear that it is necessary to make any distinction in the quantities of asphalt used whether soft paving grades, cutback or emulsion.

Ordinary emulsions of the penetration or mixing type have a viscosity ranging from 20 to 100 seconds. Emulsions of this type have a tendency to run off the road on steep grades, especially on superelevated curves. In order to avoid this difficulty, special emulsions have been developed giving a viscosity range from 200 to 400 seconds or even greater. These emulsions have noticeably less tendency to run off the road. However, the high viscosity of emulsions can be achieved in different ways and in certain cases an increase in viscosity has been accompanied by a slower setting which resulted in the loss of screenings.

It is hoped that the foregoing outline will help to clarify the problem and that the charts and method of calculation will serve to remove some of the uncertainties involved in current practice.

The procedure proposed is not considered to be complete or final and may be subject to correction or modification when more data are available.

It is desired to acknowledge the helpful comments and suggestions of T. H. Dennis, Maintenance Engineer (now retired); Nelson Bangert and Clarence Woodin of Headquarters maintenance department, G. A. Tilton, Jr., assistant construction engineer; C. E. Bovey, assistant district engineer at Stockton, and C. V. Kiefer, member of the E & D Committee, Pacific Coast Division, Asphalt Institute.

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- (1) C. V. Kiefer, Second Nevada Asphalt Forum held at Carson City, Nevada, November 18, 1948. Published in The Crushed Stone Journal, June, 1949.
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- (3) Roberto F. Tagle, Buenos Aires, Argentina, Personal Communication.
- (4) F. N. Hveem, The Centrifuge Kerosene Equivalent as Used in Establishing the Oil Content for Dense Graded Bituminous Mixtures, Proceedings of the A.A.P.T., 1942. Reproduced in California Highways and Public Works, 1942.



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The length of the trailer is 168 in.; width, 78 in. The entire unit, as described in the "CEC Bulletin", weighs 4,450 lb., distributed over two 7.50 x 20 eight-ply tires.

The generator is a 15 KVA type, powered by a gasoline or diesel engine, and develops enough power to drive at the same time all the machines without overloading.

### Saw is Main Tool

The principal implement is a radial saw powered by a  $7\frac{1}{2}$ -hp., 3,600 rpm., 208-volt, 3-phase motor, using blades up to 20 in. in diameter, and equipped to cut either wood or metal. The workbench is a wooden-top saw table, 12 in. wide, extending 24 in. to either side of the saw column and jack-stand.

Two folding roller-conveyors, each 12 in. wide and 5 ft. long, may be locked into position at the right and left ends of the saw table and leveled by means of adjustable legs on the outboard ends, forming a lumber guide strip 14 ft. long.

For miscellaneous small tools, a metal box 8 in. wide, 12 in. deep, and

48 in. long is located on the right side of the trailer. On the left side, between the fender and the generator housing, are a rack for carrying the roller conveyors and an 18-in. compartment containing the various saw blades and cutters.

As adopted by the Bureau, the unit will have six wire receptacles grouped as follows:

2—10-amp, 110-volt, single-phase for lighting.  
2—20-amp, 208-volt, single-phase for power.  
2—30-amp, 208-volt, three-phase for power.

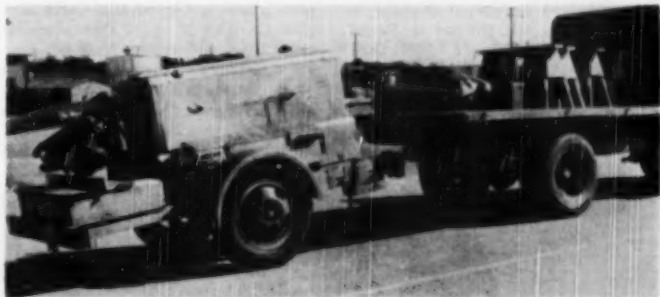
Mounted on the outside of the tool box, these sockets will permit the use of power-driven hand tools simultaneously with operation of the saw. During recent tests by the Bureau, electrically-driven portable saws, sanders, drills, and screwdrivers, as well as floodlights and air compressors, were successfully operated for extended periods, and in various combinations. In addition, a 20-hp., 3-phase, 220-volt motor driving a 300-amp. d.c. welding generator was started and operated while the saw was in operation, and welds with 5/16

in. rods were accomplished without loss of saw-blade speed.

Before acceptance by Bu Docks, the unit underwent exhaustive tests at the Naval Construction Battalion Proving Ground, Port Hueneme, Calif. On test jobs, the unit saved an average of 55% of the normal construction time. During a "Quonset Hut" building project, five men were employed continuously to feed material through the saw at the rate of 5,000 bd. ft. per hour. In straight cut-off work, as much as 40,000 bd. ft. of 1-in. by 12-in. by 24-ft. material could be handled through the saw per day.

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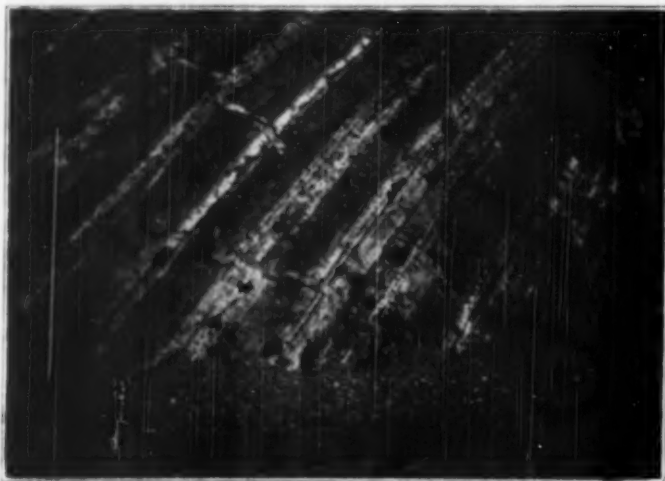
★ Up to six power-driven hand tools can be operated simultaneously with the saw.

# Recent and Prospective Droughts

By **Halbert P. Gillette**,  
Mem. Am. Soc. C.E.

**L**AST March in **ROADS AND STREETS** an article of mine gave data showing that for at least 90 years the Nisqually Glacier in Washington has been shrinking, and for at least 80 years the annual runoff of the Columbia River has decreased. It was shown that varved rock strata indicate a climatic cycle of about 600 years, with a sub-cycle of  $\frac{1}{3}$  that length. The accompanying illustration shows those two cycles, the white calcareous beds recording the dry phases of those two cycles. By means of lake varves (i.e. annual layers of sediment), tree-rings, annual extremes of elevation of the Nile back to A.D. 620, and other data, it has been found that coincident rainfall peaks of the 603 year, the 201-year and 67-year cycles occurred in A.D. 1683. Hence they will have coincident rainfall minima in 1984.

Evidence as to the above mentioned cycles was presented by the writer eight years ago in a paper entitled "Menacing Long Series of Droughts," read before the National Reclamation Association at its annual meeting in October, 1941, and printed in **ROADS AND STREETS** December, 1941, and in the *Pan-American Geologist*, February, 1942. Since then the writer's researches on weather and climatic cycles have added to the evidence then presented.



★ Varved rock strata show climatic cycles of 600 and 200 years between centers of droughts

Recently the London Sunday Express quoted Dr. C. E. P. Brooks, Secretary of the Royal Meteorological Society, as follows: "The earth's climate has been changing since about 1850. The process is speeding up, but it is still too early to say if the change is to be of long duration, say of thousands of years, or if we are to have a temporary change lasting, say a century. We shall know better in the next 25 years whether we are going back to the [dry-warm] climate of between 400 and 1000 A.D."

Dr. Brooks based his conclusions on what is happening in the Arctic where the fish are moving farther north each year because it is becoming warmer there. The cultivation of crops and the raising of animals is just beginning to be possible again in parts of Greenland, he said.

In his "Climatic Changes," the late Dr. Ellsworth Huntington of Yale gave a graph of his measurements of California sequoia rings which shows a long drought having its climax about A.D. 740. Since this is about 900 years prior to the great advances of European glaciers, I infer that there is a climatic cycle of about 1800 years or three times the length of my 600-year cycle. Intervals between the greatest moraines in the last Ice Age were about 1800 years, as shown by varves deposited annually in ancient glacial lakes that are now dry. Lesser mo-

raines recorded the 600 and the 200 year cycles.

Annual maximum and minimum levels of the Nile at Cairo since A.D. 620 record the 200-year cycle and cycles of  $\frac{1}{3}$  and  $\frac{1}{9}$  its length, and show the dry maximum of the 1800-year cycle about A.D. 780. The subsequent long trend of increasing levels of the Nile has often been ascribed to silting up of the river bed. But the writer infers that the cause was the 1800-year cycle. There is no evidence of silting of the bed between the earliest record A.D. 620 and 780, for the annual levels of the river decreased during those years.

In *Quaternary Climates* (pub. in 1925 by Carnegie Institution, Washington, D.C.), Prof. J. Claude Jones estimated that Walker Lake, Nevada, had acquired its chlorine from salt delivered by Walker River in about 1160 years. He inferred that the lake went dry and its bed was silted over before it began to fill again. This indicates that it was dry about A.D. 760, which agrees closely with the time of lowest levels of the Nile above cited. An article by C. E. P. Brooks in *The Meteorological Magazine* (London), July 1935, gives four graphs of thicknesses of Lake Saki (Crimea) varves, California sequoia rings, and approximate levels of the Caspian Sea and of European lakes. The last two graphs indicate a maximum drought about A.D. 740, as compared with about 760 for Walker Lake and 780 for the Nile. It is significant that the Dark Ages in Europe and many years of "political chaos" in China had their center about A.D. 780. Since there is good evidence that this catastrophe was due to the 1800-year cycle (and probably the 5400-year cycle also), it will not occur again for several hundred years. But since the 600 and the 200-year cycles are harmonic sub-cycles of the 1800-year cycle, we are now in the midst of a creeping drought whose maximum is only about two decades ahead.

Because there are many short weather cycles, the progress toward such a climax has not been, and will not be uniform. The "dust bowl" years of the middle 1930s were largely due to the Bruckner cycle whose length is half that of the 67-year cycle above mentioned. Its next wet peak will be due in the summer of 1950.

The 8.44-month cycle will have its wet peak January 18, 1950; it is a sub-cycle of the 19-year cycle whose last wet peak was in July, 1946. These shorter cycles are mentioned to exemplify the complexity of long range forecast problems, which is rendered additionally complex by other factors, notably opposite effects in different

regions due to "permanent" cyclonic control in some regions, and anticyclonic control in other regions, as pointed out in the September issue of *Water and Sewage Works*.

One of the factors that adds complexity is that the same cycle may cause fall and winter rainfall to be opposed in phase to that of spring and summer. This was pointed out in one of my articles several years ago. It tends to obscure the existence of short cycles when the analysis relates to annual rainfall in regions having about the same rainfall in each of the four seasons.

Hydraulic engineers concerned with water supply problems need not worry about the short weather cycles; but should carefully study evidence of long climatic cycles. Fortunately those of greatest importance are few in number and are harmonic. The dominant harmonic series is triplex, and has lengths in years of 67, 201, 603, 1809, 5427, etc. These are very outstanding in geological records, such as series of similar beds of rock, raised beaches around lakes, sea-shore terraces, and intervals between successive glacial moraines. But unfortunately meteorologists have not investigated geological data enough to be convinced that these cycles are regular as to their lengths, harmonic as to their relationships, and greater in amplitude (departures from a mean) the longer the cycle. The dry and wet phases of these climatic cycles increase as the length of the cycle increases, the length being that between maxima.

As Bruckner pointed out in his book in 1890, his climatic cycle has alternating wet-cold and dry-warm phases. He estimated its length between centers of similar phases to be about 35 years. But his data covered too short a period to give more than an approximate length. Lake Saki varves going back 4200 years and California tree-rings for 3200 years show a cycle that is exactly 67 years, which often has an intermediate peak causing a cycle of 33.5 years. One of the cold-wet peaks of the Bruckner and the 67-year cycle occurred in July, 1816, which in New England was so extreme that 1816 was called "the summerless year." This extreme was partly due to the 19-year cycle whose peak was in the summer of 1813, and which has a 3 1/6-year subcycle whose peak was in 1816.

Recent progress in cycle research has been due largely to a very old discovery, namely, that distinct layers of sediment have been deposited annually in lakes and in seas. These layers are called varves. That they were annual depositions was surmised in 1769 by C. F. Nordenskiöld, a Swedish military

# New! ADAMS

## Traveloader

### "Loads as it Travels"



#### High-Speed, Heavy-Duty Machine Self-Propelled • Self-Feed • Belt-Type

Product of several years of engineering development and job testing, the new Adams Traveloader is the fastest, most efficient and economical machine of its kind on the market. Important advantages include: **CENTRALLY-LOCATED CONTROL STATION** . . . High—above dust area—affords operator better vision in all directions, both working and traveling • **HIGH-SPEED REVOLVING FEEDER** . . . Delivers a continuous stream of dirt, sod, waste scarified material, snow, etc.—at a faster rate than other machines, for greater over-all production • **HEAVY-DUTY INDUSTRIAL-TYPE ENGINE** . . . Built for long, dependable, low-cost performance • **RUGGED CONSTRUCTION THROUGHOUT** . . . Designed for long life—quick, easy servicing.

Don't buy any loading machine until you've seen the great new Adams Traveloader. Write for illustrated catalog. Do it today!

#### Clip and Mail Coupon Today

J. D. ADAMS MANUFACTURING CO.  
219 South Belmont Avenue  
Indianapolis, Indiana

Please send me illustrated, descriptive catalog on the new Adams Traveloader.

Name.....

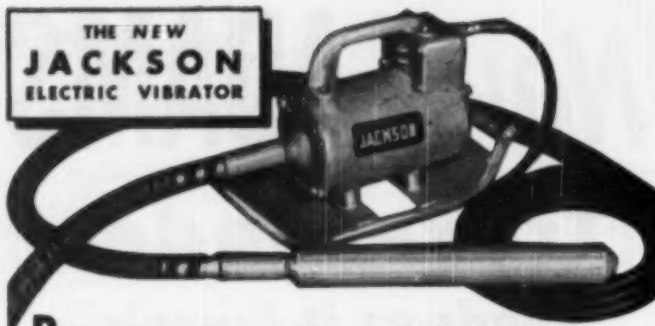
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Official Connection.....

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**THE NEW  
JACKSON  
ELECTRIC VIBRATOR**



## POWERFUL...FAST...RELIABLE

The Jackson Model FS-150A Flexible-Shaft vibrator with its 2 1/2 HP Universal motor has more than ample power for uninterrupted placing of the stiffest mixes even when using the maximum length of shaft (28'). Provides 8,000 to 10,000 VPM and is built to withstand the most severe usage.

## PLUG IT IN ANYWHERE

that 115 volt, 60 cycle single phase AC or Direct Current is available.

## HANDY AS A POCKET IN A SHIRT

May be had with any length of shaft up to 28' and choice of 3 vibrator heads. And since it weighs but 50 lbs., it is ideal for thin or thick sections, for high places, reaching the otherwise difficult-to-get-to spots, incasing structural members and, in fact, every phase of general construction.

## QUICKLY ADAPTABLE TO DRILLING

WET OR DRY GRINDING. The FS150A is truly an outstanding buy for the general contractor. See it at your Jackson Distributor or write for complete details.



**JACKSON  
ENGINE-DRIVEN  
FLEXIBLE-SHAFT VIBRATOR**

Model FS-6A is the finest of the engine-driven, flexible-shaft type vibrators. 4.7 H.P. engine supplies more than enough power under all conditions. It's available with 3 heads for thick or thin sections. Shafting is furnished in 7' and 14' lengths up to 28'. Frequency (up to 7500 VPM) and amplitude are carefully balanced. Grinding and drilling attachments available. An excellent performer as proven on thousands of jobs. Write for details.

## OTHER MONEY-MAKING VIBRATORS

for every type of construction—thin sections, mass concrete placement, highway, airport and municipal paving. Soil compaction. Portable Power Plants.

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Get your free copy of the Jackson "POCKET GUIDE" describing the entire line.

**ELECTRIC TAMPER AND EQUIPMENT CO., Ludington, Mich.**

engineer. Swedish geologists were the first to measure thicknesses of many varves, but they erred in thinking that varves occurred only in glacial lake beds. The writer has measured varves in stratified rocks of marine origin in a dozen of our states and in Mexico. Since cyclic variations in the thickness of rock varves correspond with those in tree-rings, there can be no longer any question as to their having been deposited annually.

The white calcareous beds of the accompanying photograph were deposited during the warm phases of cycles, because evaporation of carbon dioxide from seawater caused precipitation of calcium carbonate. Rock varves one-tenth of an inch thick sometimes have a white calcareous lamina that records the precipitating effect of the summer's heat.

Aided by this knowledge, pairs of white and black beds in stratified rock become data by which the lengths of climatic cycles are determinable.

Since the drainage areas whence these sediments came were very large, stratified rock data are far more reliable than any other data for determining the lengths of long climatic cycles.

Inscriptions in three languages on the Rosetta Stone were found 150 years ago, and served to disclose the meaning of Egyptian hieroglyphs, series of similar rock beds evenly spaced are hieroglyphic records of climatic cycles, and varves therein are Nature's Rosetta Stones that disclose the cycle lengths.

## New Highway Engineering Recruitment Booklet Ready

"Highways are a measure of civilization. There is no more important, no more useful, no more challenging, no more honorable profession than that of highway engineering."

That declaration opens the new highway engineering recruitment booklet, "Highway Engineering, a Challenge and An Opportunity," published recently by the American Road Builders' Association, the nation's oldest good roads organization, as part of that group's heightened drive to assist Federal, state, county and local road units in overcoming a serious shortage of highway engineers.

The 44-page booklet was prepared by the Advancement of Highway Engineering Committee of ARBA, headed by C. R. Hanes, field engineer of the Bureau of Construction, Ohio State Highway Department, Columbus. It is designed to acquaint college students and others about to enter college of the possibilities and scope of highway engineering.



## NEW EQUIPMENT AND MATERIALS

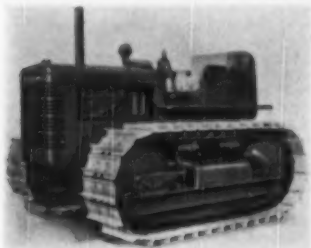
### New and Improved Construction Products

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 118. Each item is numbered. Just circle the corresponding number on the card and mail.

1

#### Increased Power for I-H Tractor

Higher power-performance ratings for the International TD-9 diesel crawler tractor, resulting from new design changes in the "9" series 4-cylinder engine, have been announced by International Harvester Co., Chicago, Ill. Work capacity of the crawler has been increased through engine improvements which provide more horsepower at the



International TD-9 Diesel Crawler Tractor.

flywheel and drawbar. The TD-9 now in production has drawbar horsepower of 40.5, compared to 38.88 in the previous model. Horsepower at the flywheel is 51.5, an increase of 2 hp.; and belt horsepower, formerly 45.91 has been raised to 48.5. Maximum drawbar pull in first gear with the engine operating at maximum torque is 11,400 lb., a new high representing 1,150 lb. more hauling power. Travel speeds are unchanged: five forward to a high of 5.3 m.p.h. and one speed reverse, 1.7 m.p.h. Greater engine power has been obtained through a redesigned combustion system featuring new pistons, an improved precombustion chamber, simplified injection nozzles, the new "A" model IH fuel pump and a higher compression ratio, 15.7:1 as compared to 14.4:1. In addition, the engine now has a counterbalanced crankshaft and new connecting rods, for smoother operation and longer service life of parts.

2

#### 5½-yd. Shovel

A new 5½ yd. shovel, crane and dragline, Model 4500—added to the line of Manitowoc Engineering Works, Manitowoc, Wis., has air controls for all operating clutches and brakes, straight diesel power and crawler drive. Unusual ease of movement from job to job is claimed as a special feature possible because major dismantling is not required. Loading or unloading from trailer or flat car can be done in three to five days according to the manufacturer, with the machine handling its own heavy components. On the job, travel speed is .77 miles per hour, with ground, bearing pressures are as low as 9.6 lbs. per inch.

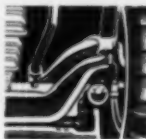


## Any MICHIGAN owner will tell you

—why he bought a Michigan Truck Excavator. It could have been Michigan's famous mobility . . . the heavy duty Michigan truck chassis . . . high yardage through air controlled clutches . . . cast steel turntable base . . . hook rollers . . .

But why not let a Michigan owner tell you in his own words. Your local Michigan dealer welcomes the opportunity to show you the most complete line of ¾ and ½ yard excavators available. It will pay you to get in touch with him today.

**MICHIGAN**  
**POWER SHOVEL COMPANY**  
480 Second Street  
Benton Harbor, Michigan, U.S.A.



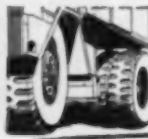
#### EASY STEERING

Heavy duty worm and roller steering gear, 20-inch steering wheel, minimize steering fatigue and help you thread through traffic easier, get around on the job faster.



#### EASY SHIFTING

Smooth meshing gears, no "fighting" the shift lever or clutch pedal. Auxiliary transmission provides multiple speed range for every highway condition, for tough off-the-road travel.



#### POSITIVE TRACTION

Big, traction-tread tires easily pull you through deep sand, mud or heavy snow without delays. Their high-flotation takes you over soft ground with far less chance of bogging down.



#### COMFORTABLE CAB

Operators like it! Plenty of leg and elbow room for big men. Wide angle visibility through big, rubber-set windshield and windows. Familiar, automotive-type controls.

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 118. Each item is numbered. Just circle the corresponding number on the card and mail.



Model 4500 Standard Shovel With 38½ ft. boom, 27 ft. stick and 8½ yd. dipper.

Shovel booms are available in lengths of 28 ft. 6 in. with 27 ft. stick and 5½ yd. dipper; 50 ft. with 37 ft. stick and 5 yd. dipper; or 60 ft. boom with 45 ft. stick and 4½ yd. dipper. Optional dragline and clamshell boom lengths vary from 100 ft. to 140 ft., with the upper 75-95 ft. made of aluminum alloy. All-steel lifter-booms are available in lengths from 87 foot up, with crane rated lifting capacity of 100 tons at a 20 ft. radius.

3

### 1 Cu. Yd. Shovel

A new 1 cu. yd. machine, the Marion Type 43-M, has been announced by Marion Power Shovel Co., Marion, O. With various front-end combinations, the 43-M serves as a shovel, dragline, clamshell, crane, backhoe and pile driver. Front-end changeovers in the field can be made quickly and easily. Simplicity of design eliminates the need for machinery, lagging or sprocket changes in

making front-end conversions. A single boom can serve for both shovel and backhoe work, but a gooseneck boom is optionally available for owners who prefer it for backhoe service. A single boom, with butt-jointed sections, is used for dragline, clamshell, crane or pile driver service. Other 43-M features include: Simply-designed and easily-accessible machinery (there are only two horizontal shafts on the entire machinery deck);



Type 43-M Equipped as a Dragline.

22 critical friction points equipped with ball or roller bearings; shafts made of alloy steel; heat-treated, machine-cut gears; drums of alloy cast steel; independent chain crowd; Marion air control system; independent boom hoist with overrunning clutch, holding brake and safety ratchet is standard equipment and permits fast, safe control of the boom; oversize, slow speed compressor; lubrication fittings grouped at points of easy access.

4

### Bulldozer and Trailbuilder

New bulldozer and trailbuilder equipment has been developed by Southwest Welding & Mfg. Co., Alhambra, Calif., for use on current model Allis-Chalmers



New Southwest Equipment.

and Caterpillar tractors. In these units the overhead "A" frame structures have been entirely eliminated, providing proper balance the full length of the track drive and better visibility for the operator. The new radiator guard type mounting is strong and durable. This equipment can be furnished for either rear or front mounted control units. Bulldozers are available in either the rigid bowl or tilting bowl types.

5

### All-Metal Scales

New all-metal triangular and flat scales, announced by Cal-Pan Corporation, Alhambra, Calif., are claimed to offer the following basic accuracy characteristics: Accuracy in Design—the position of each graduation is computed to 7 decimal places for engine engraving on a "Master" at 68° F. Each scale is an exact duplicate of its "Master" with needle-sharp graduations in black against a white background. Each light, all metal scale has an even coefficient of expansion throughout of 0.0000125 per degree of Fahrenheit temperature—thus assuring permanent retention of accuracy. The surfaces of the triangular scales form an "Inverted-V" which brings the

LIGHTER

STRONGER

## WELLMAN Williams Type BUCKETS

Stronger because they're constructed of welded rolled steel... lighter because non-essential weight has been eliminated. Wellman buckets meet every requirement of heavy service with longer life and lower cost! A type for every service: Multiple Rope, Power Arm, Dragline, Power Wheel, Special Service. ¾ to 16½ yd. capacity.

SEND FOR BULLETIN

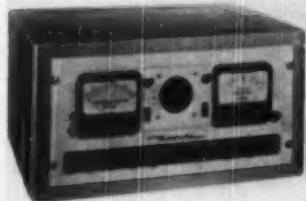
THE WELLMAN ENGINEERING COMPANY  
7003 CENTRAL AVENUE CLEVELAND 4, OHIO

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 118. Each item is numbered. Just circle the corresponding number on the card and mail.

fine edges of the scales right down to the paper for easy, accurate measurements without the flat surfaces ever touching the work.

#### 6 Frequency Monitor for 2-Way Radio Systems

Operators of 2-way FM radio systems will find a new, highly sensitive frequency-deviation monitor, recently announced by Motorola Inc., Chicago, valuable in maintaining good communications. The unit performs three definite functions: it measures (1) the relative strength of signals

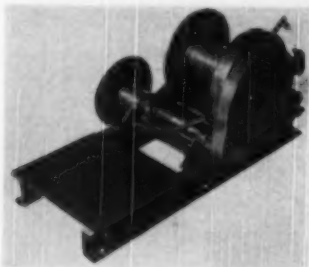


Motorola Frequency Monitor

being transmitted, (2) the magnitude of frequency modulation, and (3) the error displacement of the signal from its assigned center frequency. Designed for 117 volt, 60 cycle operation, the unit monitors up to five carrier frequencies in either the 25-50 mc. band or the 152-174 mc. band. Additional frequencies may be monitored by the simple exchange of control crystals. These crystals, being temperature compensated, introduce a negligible error of less than .00005%.

#### 7 Adaptable Power Hoist

Rapid installation of either gasoline, electric or air motors is claimed to be an exclusive feature of the new power hoist announced by Beebe Bros., Seattle, Wash. Using a standard Beebe 5-ton all-steel hand hoist, mounted on rigid steel frames, provision has been made for the installation of any type of motor. Each hoist is



New 1950 Beebe Hoist

equipped with a 60-tooth  $\frac{1}{2}$  in. pitch sprocket, single or double according to the amount of power applied. In turn, the sprocket is geared to the hoist through an intermediate drive shaft on a 24:1 gear ratio. The shaft itself has a hand-operated gear shift lever to disengage it from the hoist for rapid cable unspooling, or for hand operation in either the 24:1

## 6 REASONS WHY YOU CAN BANK ON THE

# WARCO

high productive factor



- Completely cab-controlled blade travel from 90° on one side to 90° on the other
- Retractable scarifier, blade revolves 360° without removing scarifier or teeth
- Sliding moldboard
- High working clearances, front and rear
- Mechanical steering with hydraulic booster
- Interchangeable wheels

An almost impassable road in Lamar County, Alabama, becomes a two-lane rural highway with the help of a WARCO 100 H. P. Motor Grader. Stubborn Alabama red clay was quickly put in place as the operator bank-sloped, ditched and shaped in exceptionally fast working time.



High-angle bank cutting or routine grading . . . whatever assignment you give your WARCO Motor Grader, it continues to deliver an amazingly high productive factor. Why? Because its finger-tip hydraulic controls and speedily positioned blade help to turn out more work in fewer hours . . . and every foot it travels is a foot it works. That's why you can bank on the WARCO high productive factor.

See the WARCO . . . compare its construction, operation, performance . . . then you'll decide that your next motor grader must be a WARCO.

**4D-100 WARCO Heavy Duty 100 H. P. Motor Grader**

**4D-76 WARCO General Duty 76 H. P. Motor Grader**

## W. A. RIDDELL CORPORATION

BUCYRUS, OHIO

*Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 118. Each item is numbered. Just circle the corresponding number on the card and mail.*

or 4:1 gear ratio. Using motors of from  $\frac{1}{2}$  to 5 h.p., speeds and lifts from 250 lbs. at 40 ft. per min. to 6,500 lbs. at 10.5 ft. per min. may be achieved with this hoist.

8

### Garbage Truck Has 4 Loading Buckets

A new rustproof, aluminum unit, announced by Duncan & Galloway Co., Detroit, Mich., has four hydraulically operated loading buckets, two on each side, that can be loaded simultaneously and operated independently to give faster loading. Dumping of the load is accomplished by hydraulic lift. Discharge of the



D. & G. Garbage and Refuse Loader

load is further simplified by tapering of the body and elimination of any obstructions such as wheel wells. The tail gate is automatically operated permitting

the driver to take the load to the dump alone and handle this part of the job from the cab without assistance.

9

### Tree Mover

Equipment for moving trees announced by The DeALL Co., Des Plaines, Ill., is stated to be capable of handling trees with 80 in. diameter balls and weighing up to 1½ tons. The basic utility of the tree mover centers around the arrangement of its three-wheel suspension, its



DeALL Continental Tree Mover

tilting boom, and adjustable tree ball sling. The frame is welded off center to the boom and cradle. This allows the tree mover to straddle the tree or hole. The front wheel swivels permitting maximum mobility and swings up out of the way during long hauls when hitched to car or truck. Two men can easily move the fully loaded tree mover. The boom and cradle can be tilted as single unit 30° forward or 30° backward by ratchet lever jack. This positioning places the boom and its ratchet lever hoist directly over the tree to be moved.

10

### Roller Has Scalloped Rib Rolls

A new compaction roller announced by Huber Manufacturing Co., Marion, O., is specially designed to meet today's exacting compaction requirements. The new unit is a 1-man, self-propelled machine



Huber Compaction Roller

engineered to give high compacting values. Thoroughly tested in more than a year of varied operations in the field, the new roller is stated to have a per lineal inch compaction of 5,387 lb. It is stated to compact 4,100 sq ft an hour at an average speed of approximately two miles per hour.

The rear rolls of the compaction roller have a series of five scalloped ribs at the outer circumference. Each rib consists of 12 4-in-high scallops and the ribs are staggered from one row to another in such a manner that there is a high point every 3¼ in. The ribs are 2 in wide and are spaced 2½ in apart. The slope of the scallops on one roll is opposite to the scallop slope on the other roll—this is true of both of the two rear rolls and the two sections of the front roll. The front roll scallops are similar to those on the rear except that the height has been lessened.

## "No Lost Motion"

### LEAF COLLECTING

### with ROAD BOSS

#### ROAD BOSS LEAF COLLECTOR

is the first practical equipment for economically removing leaves and debris from city streets. The easily maneuvered, one-man operated machine is readily mounted on

Ford or Ferguson Tractors. Operation hydraulically controlled. Dry, fluffy leaves or wet, packed leaves . . . even twigs, branches, stones, and bottles . . . are easily handled by the Road Boss. No operating time is lost, as hopper empties into truck . . . machine continues operation while truck goes to dump. This outstanding method of leaf and debris collection requires only one-tenth the manpower required by earlier methods. Ends clogged storm sewer problem. You will find it a valuable community investment. Write for more information! Some dealers territories still open.



NATIONAL SALES REPRESENTATIVE

J. W. SIMCOX, P. O. BOX 287, LA PORTE, IND.



MANUFACTURED BY

LA PORTE WELDING  
& MACHINE CO.



Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 118. Each item is numbered. Just circle the corresponding number on the card and mail.

With a set of standard rolls, the Huber compaction roller can be converted to a conventional 12 ton 2-wheel type roller.

11

### Tri-Point Rock Drills

A line of tri-point rock drills for drilling granite, sandstone, hard limestone, cement, etc., is now in production by Kennametal, Inc., Latrobe, Pa. Cutting tips are made of the vacuum sintered cemented carbide manufactured exclusively by Kennametal. The triangu-



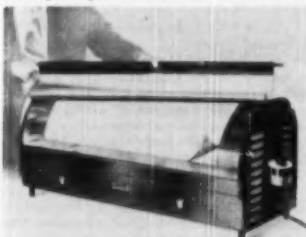
Tri-Point Rock Drill

lar-shaped design of the thick carbide tips is said to be unique, and to give maximum resistance to wear and shock, as well as freedom from packing. Drill shanks are heat-treated alloy steel. The drills are used in air or electric hammer-type drills. Diameters range from  $\frac{1}{8}$  in. to 1 in. Lengths are from 7 in. to 12 in., depending on drill diameter.

12

### 24-in. x 36-in. Whiteprinter

A new low-priced 24 in. x 36 in. white printer introduced by Peck & Harvey, Chicago, Ill., is stated to provide prints in 30 seconds at a cost of less than 2 cents per square foot. The unit uses the



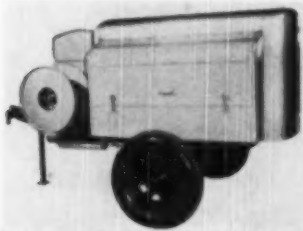
Spee-Dee Whiteprinter.

Diaz (moist or ammonia dry) process to produce positive reading white prints. It enables the making of clear, accurate black-on-white or blue-on-white positive prints from transparencies or opaque originals.

13

### Air Compressors

Two new compressors have been added to the line of portable air compressors of Gordon Smith & Co., Bowling Green, Ky.



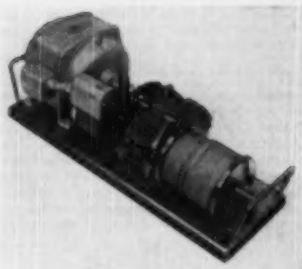
Model 105-P Compressor

One is the Model 105-P (illustrated) with 105 cu. ft. capacity and the other is a 70 cu. ft. compressor, Model 70-P. Single-stage compressors, both new models, are built with heavy duty Chrysler industrial engines, using three cylinders for power, three for compression. Mounted on two pneumatic tires, they may be towed at truck speeds from job to job. Sizes and weights of the new models: Model 105-P—overall length 115 in., width 65 in., height 62 in., weight without hose reels 1945 lbs.; Model 70-P—overall length 103 in., width 65 in., height 62 in., weight without hose reels 1485 lbs.

14

### Portable Electric Winch

A portable electric winch announced by St. Anthony Machine Products Co., Minneapolis, Minn., is designed to provide



Stampco Tugger

mobile lifting and pulling power for many jobs in the construction field.

# Now... better joint maintenance at less cost!

FAST  
RUGGED  
DEPENDABLE



As proved by highway depts. in many states, a **Tennant Joint-Cleaning Machine** now makes modern joint resealing possible... so pavement joints can now have dependable year 'round protection. This means less cost-per-mile for annual maintenance... smoother joints... fewer heave-ups... longer pavement life.

### SAVES TIME... ASSURES BETTER BOND

Powered by a 13½ h.p. engine and guided by one man, this machine's high speed cutter head whisks old seal out of joints or cracks... simultaneously cleans and roughens sidewalls to allow a good bond with new seal.

With one of these machines you're equipped for 8 different jobs in pavement maintenance... including leveling humps, cleaning irregular cracks, removing traffic lines, scoring surfaces to improve traction, etc.

### Write today!

Get the facts about this machine... and how it has PAID FOR ITSELF ON A SINGLE JOB in some cases.



G. H. TENNANT CO.  
2578 N. 2nd Street  
Minneapolis 11, Minn.



## Joint Cleaning Machines

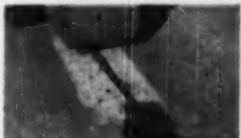
MERIT OF EQUIPMENT FOR MAINTENANCE OF FLOORS, DECKS, ROOFS, HIGHWAYS



CUTTERS are easily spaced to clean joints from  $\frac{1}{8}$ " to 2½" wide or more. Very durable.



CLEANING irregular cracks is easy as cutting follow winding Razors. No skill needed.



EXTRUDED MATERIAL shaves off instantly with 4" cutting head. Leaves smooth surface.

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 118. Each item is numbered. Just circle the corresponding number on the card and mail.

Available in a wide selection of models, the winch is powered to furnish a line pull of from 500 lb. to 1500 lb. at speeds ranging from 55-220 ft. a minute. Double reduction spur gears, specially fabricated from high tensile steel, convert the output of a high torque, repulsion-induction motor to a constant speed and power ratio on the drum of the winch.

15

### Heavy-Duty Boat Trailer

A new type heavy duty boat trailer has been announced by La Crosse Trailer Corporation, La Crosse, Wis. Developed especially for hauling a 13-ton Model



New Heavy-Duty Boat Trailer

DCB Chriscraft, the new trailer is said to have reduced owner's overland transportation costs up to 50% per trip. The trailer is of low bed design, with exceptionally low ground clearance, which reduces overall height of boat and trailer to a minimum. In addition, trailer is equipped with special saddles tailored to

fit the hull contour, including a spring-mounted center cradle which eliminates damaging strains and prevents shifting of boat in transit. Loading and unloading are easily accomplished in a matter of minutes by running trailer into water and floating boat on or off.

16

### All-Steel Fairleader

A new all-steel fairleader, announced by American Hoist & Derrick Co., St. Paul 1, Minn., is expected to find wide application in many fields where an off-lead is necessary or where more universal swiveling is required than is possible with a snatch block. The fairleader has a throat



New "American Hoist" Fairleader

large enough to pass a joint made up with Crosby wire rope clips. The sheave and head are mounted on anti-friction bearings for long trouble-free service. The new unit is designed to withstand 100 per cent of the strength of the rope. Sizes are available for  $\frac{3}{4}$ , 1, 1 $\frac{1}{2}$  in. wire rope.

17

### Fiberglass Expansion Joint

A new expansion joint developed by Owens-Corning Fiberglass Corporation, Toledo, O., is an asphalt saturated Fiberglass board, designed to meet the requirements of the concrete construction industry. The joint complies with standard specifications M-59-42 of the American Association of State Highway Officials. The joint is used in butt-type expansion joints and in triangular or rectangular tongue and groove joints. It is available in  $\frac{1}{2}$  in.,  $\frac{3}{4}$  in. and 1 in. thicknesses. The Keystone Asphalt Products Co., Chicago, Ill., will handle the national distribution of this product, under the trade name of Kapco expansion joint.

18

### 30 Ton Wrecker Truck

A large, custom-built wrecker, the first of a 14 vehicle fleet addition, has been completed by Ward LaFrance Truck Corporation, Elmira, N. Y. for the Department of Sanitation of New York City. Designed to fit Sanitation Department specifications, the new vehicle will be used in wrecker service of the city's fleet of approximately 3,500 heavy-duty ash and garbage removal trucks. A 6 x 4 tandem drive vehicle, the wrecker will



Wrecker for New York City Department of Sanitation.

**Wake up,  
ROADBUILDERS!**

**it's  
spring!**

**You're! Arise and shine, for you'll find these cost-cutting, high-production, labor saving Road Builders Batching Plants you have dreamed about all winter—are here! Butler engineers have made them real.**

**Fast acting, highly accurate weighing batchers . . . jam-proof, wear-resistant gates—as quick in reaction as a jet plane pilot . . . Large capacity bulk cement plants that will "hide you over." . . . In short, for the biggest, most successful road building season you've ever had, see BUTLER BIN.**

**BUTLER BIN COMPANY**  
WAUKESHA, WISCONSIN

959 BLACKSTONE AVE.

When writing advertisers please mention **ROADS AND STREETS**, April, 1950

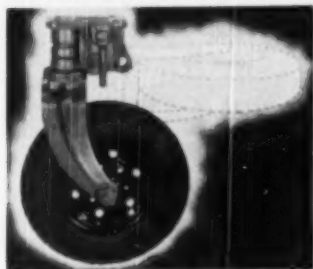
Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 118. Each item is numbered. Just circle the corresponding number on the card and mail.

be one of ten similarly constructed cab-over-engine models. Four conventional 4 x 4 models, with the same wrecking equipment, are also being built. The truck features a double alloy steel heat-treated frame and two independently-operated rear winches. Each winch is capable of hoisting over 10 tons. The truck is equipped with a pintle hook for towing, as well as two hydraulically-operated stabilizer jacks to support the rear and during hoisting operations.

## 19

### Trailer Landing Gear

A new retractable landing gear assembly that can be attached easily to all types of two-wheel single-axle trailers, announced by The United Mfg. Co., Bedford, O., provides for easy manual moving or positioning of fully-loaded units as well as a steady-rest for unhitched trailers. Recommended for use with heavy industrial portable equipment, such as com-



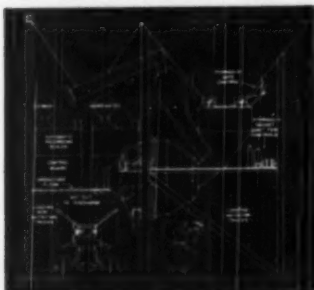
Swivel Caster Assembly for Trailers

pressors, generators, pumps, concrete mixers, cable reels, etc., this new landing gear facilitates rapid and easy trailer positioning under a variety of working conditions. When a trailer equipped with one of these new units is attached to a towing vehicle, the wheel and fork can be retracted a full 90 degrees and swiveled 90 degrees to assure clearance of all road obstructions. A snap-action positioning pin positively locks the gear in either down or retracted position. Over-all height of landing gear in down position is 18½ in.

## 20

### "Package" Central Mix Plant

A new line of pre-shrinking and central mixing equipment is now available from a new organization, SuPREMIX,



Sketch of Newly Developed "Package" Central Mix Plant.

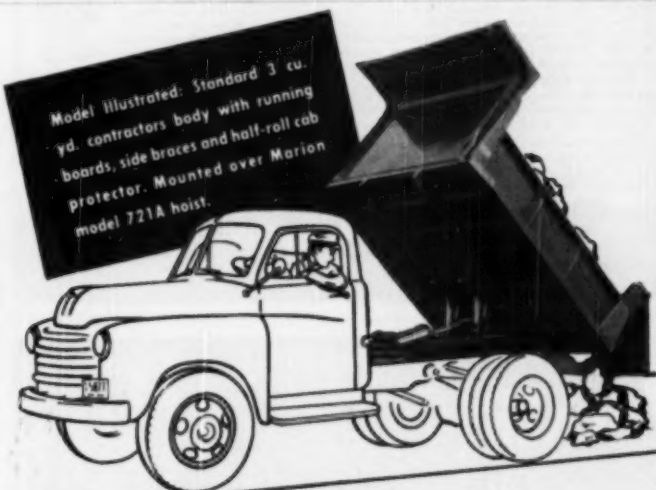
Inc., Adrian, Mich. Featured in the line is a new type of central mixing plant, claimed to be unique in several respects. The plant was designed for ready-mix plant operators, builders of large projects and paving contractors. This equipment is stated to be so designed that it will handle the two principal trends in the production and handling of ready mixed concrete: (a) Transit mixer operators who are now pre-shrinking their concrete to get better quality concrete and gain up to 50% greater payload per trip. (b) Many operators are delivering air entrained concrete in non-agitating equipment. The plant equipment is offered in several standardized packages or "tailor" engineered to fit individual plant-site and operational requirements. The tilting mixer is furnished complete with supporting frame structure. Because of its new tilting arrangement the mixer is located much lower in the structure thus saving considerable head-

room and giving lower over-all plant height. There are two other advanced features claimed for the mixer. One is the blade arrangement which gives a fast and thorough mixing action. The other is the integrally mounted Plasto-graph which automatically signals the consistency of the concrete in the mixer before the end of the mixing cycle. Another major unit of the line is the concrete dumper. This non-agitating delivery equipment was specially designed for the delivery of air entrained concrete.

## 21

### Roller Shafting for Tractor Replacements

The Allied Steel Products, Inc., Cleveland, O., specialists in replacement parts and special repair and maintenance steels for construction equipment, is stated to have brought about a marked improvement in shafts to fit the Cater-



## Stay Ahead of the Job With "On The Job" Design

It's the day-by-day performance that counts. That's why Marion Bodies and Hoists will help you stay ahead of the job.

Every Marion unit is designed "On The Job" under actual working conditions. Faster loading and dumping . . . extra pounds on every trip . . . longer service life . . . are engineered into every Marion unit.

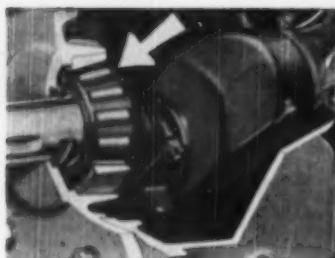


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**MARION METAL PRODUCTS CO., MARION, OHIO**



## Why WISCONSIN HEAVY-DUTY Air-Cooled ENGINES Run on Timken Tapered Roller Bearings

Ever since the first Wisconsin Air-Cooled Engine was built over 20 years ago, the crankshaft of every one of these fine engines has been supported by Tapered Roller Bearings at BOTH ENDS. Here's why:

1. Tapered Roller Bearings take up all End Thrusts and Radial Loads (impossible with other types of bearings). You can mount your drive directly on the extended crankshaft of any Wisconsin Engine without the need for an extra thrust bearing or outboard bearing.

2. Tapered Roller Bearings resist wear to a greater extent than other types of bearings not only because of the file-hard surfaces of Timken Tapered Bearings but also because these bearings are inherently SELF-CLEANING. Oil enters at the smaller end of tapered roller bearings and centrifugal force carries it out through the large end, thus preventing accumulations of dirt and sludge that is often present in the oil. (Tapered bearings cannot develop shaft-cutting abrasive surfaces.)

3. Tapered Roller Bearings permit flexing of the crankshaft to a much greater degree than the longer, rigid plain bearings which cannot stand up under flexing conditions, resulting in wearing "bell-mouthed" or failing completely. We have yet to hear of a single case of Wisconsin Engine bearing failure.

The use of dependable Tapered Roller Bearings in ALL Wisconsin Engines from the smallest to the largest . . . 3 to 30 hp., single cylinder, 2-cylinder and 4-cylinder . . . is typical of the engineering diligence devoted to providing the user with "Most H.P. Hours of on-the-job service".



Single cyl.  
3 to 9 hp.



2-cylinder  
7 to 13 hp.



V-type 4-cyl.  
15 to 30 hp.

WISCONSIN  
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## WISCONSIN MOTOR CORPORATION

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AND SOIL SAMPLING TOOLS!

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We invite you to write us today for Bulletin 26-RS. There are great savings when you use this 12-tool sampling kit, so don't delay.

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Soil density for bearing data • sewer lines • etc.

**ACKER DRILL COMPANY, INC.** SCRANTON 3 PENNSYLVANIA

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pillar D-E Rollers. Allied has produced a shaft by upset forging which forms the center flange in an unbroken grain which makes it stronger and with less possibility of wear or cracking. The shafts are made of special precision steel, heat treated on all bearing surfaces by the induction method eliminating possible distortion, checking and cracking. They are machined and ground to extra close tolerance to assure positive fit.

22

### Veri-Purpose Hose

A new hose, stated to be capable of eliminating the necessity of having several different types of hose on hand for varied requirements, has been announced by Carlyle Rubber Co., New York, N.Y. It is stated that the hose will satisfactorily meet the average industrial organization's needs for handling all of the following: Air, Water, Gas, Oil, Grease, Paint, Insecticides, Alkalies, Oxygen, Solvents, and many other liquids.

23

### Split Thrust Washer

A split washer, announced by the Saginaw Bearing Co., Saginaw, Mich., is designed to facilitate repairs and to obviate the necessity of dismantling heavy



Sabeco Split Thrust Washer

construction equipment to install new bearings. The replacement split washers are made of "Sabeco" bronze, which is the combination of a high percentage of pure copper, pure tin and pure lead with a maximum of 2% impurities, assuring maximum life and efficiency and top performance for these all-speeds heavy-duty jobs.

## VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

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**VULCAN TOOL MFG. CO.**  
QUINCY, ILL.



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24

### Floodlight

A new type VE-18 open floodlight now available from Westinghouse Electric Corp., Pittsburgh, Pa., is a 750-1,500 watt open type, all porcelain floodlight suitable for general area lighting, construction areas, and other applications recommended under the new NEMA Standard Floodlight layouts. The VE-18 is of one-piece welded



Floodlight and Bracket

steel construction with porcelain enamel finish, gray outside and white inside, with average reflectivity of 82 per cent or more. With a beam spread of approximately 135°, the unit provides higher efficiency where the greater lamp shielding of the type AF-16 is not required. Beam efficiency exceeds 70 per cent, as compared to the 55 per cent minimum required under the NEMA Standards. A new bracket is available to extend the Westinghouse swing-over feature to all hayonet heel construction floodlights.

## MANUFACTURERS' LITERATURE

25

### Diesel Engine Specifications

A new bulletin (No. 5291) containing complete specifications of all automotive and industrial models of HR-400 Cummins diesels has been announced by the Cummins Engine Co., Inc., Columbus, Ind. These 4-cycle, 4-cylinder Cummins diesels develop a maximum of 100 hp at 1800 rpm, and are available in six models for use in all types of highway and off-highway automotive applications, and a wide range of industrial uses, including power units.

26

### Safety Device for Conveyors

A simplified backstop which automatically prevents the "backing up" or "running away" of inclined conveyors, bucket elevators and similar equipment, announced by The American Pulley Co., Philadelphia, Pa., is a ready-made device for immediate installation. The backstop is a ratchet-type device which automatically operates when power interruption, overload cutout, or failure of the prime

## 'ROGERS' Tagalong' Trailer AND YOUR DUMP TRUCK



### ...form a PROFIT-PRODUCING TEAM

Contractors everywhere are turning to the Rogers "Tagalong" for a bigger day's work with maximum economy.

One man can do all jobs. Load and unload trailer, connect and disconnect

it; drive truck and operate equipment carried.

Ideal for light and medium shovels, cranes, bulldozers, etc.

Write for complete information.

Showing cable around sheave and dump body about to be raised to engage towing tongue.



Body elevated. Tightened cable has raised draw-bar and engaged towing tongue. Safety coupling pin is inserted. Trailer is ready to roll when body is lowered.



## ROGERS BROTHERS CORPORATION

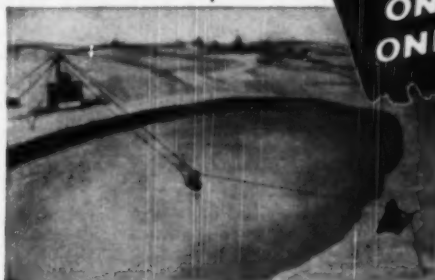
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ONE MAN ---  
ONE MACHINE



Cheapest  
Way

TO DIG  
& CONVEY

Above picture shows a typical setup of a Sauerman Slackline Cableway handling a deep sand and gravel excavation. Operated by one man, the cableway bucket scoops a heaping load of material from under water, lifts and conveys the load at a speed of 400 f.p.m. and dumps into a hopper on top of the aggregate plant, then returns by gravity to the digging point. Swinging in a wide arc, the machine is able to move a huge yardage at one setup of the mast.

● Manpower conservation—important for profitable production—is a major economy with Sauerman Slackline Cableways.

One, easily trained man handles the entire operation of digging, conveying, elevating and dumping.


Sauerman Slackline Cableways are designed for digging deep in any kind of ground—wet or dry—loose or hard-packed—for dredging material from pits, ponds or rivers and lifting to a high delivery point. Power consumption, either gasoline, electricity or Diesel, small on basis of tonnage handled. Upkeep simple—initial cost low.

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588 S. Clinton St.

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Exclusive features, expert design and superior construction characterize Owen buckets. Long life with dependable service has resulted wherever Owens have been put to work.

The latest catalog is now available. You'll doubtless want to look it over, keeping your current excavating, material handling and dredging equipment demands in mind. Write for the catalog TODAY.

**The OWEN BUCKET Co.**  
 6070 Brookwater Avenue Cleveland, Ohio  
 Branches: New York Philadelphia Chicago St. Louis, Cal.

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mover occurs. It can be mounted in any position on the head shafts of conveyors or elevators. As long as the shaft is turning in the proper direction, the pawl is entirely disengaged from the ratchet, so that there is no drag, no vibration and no noise.

#### 27

#### Industrial Wheel Tractors

A new booklet on industrial wheel tractors, published by the Oliver Corporation, Chicago, Ill., covers the complete Oliver line and includes specifications,

cross sections and detailed data on engines and transmissions, as well as many application photos. One section is devoted to the matched allied equipment available with Oliver industrials—such as bucket loaders, maintainers, plows, mowers, backhoes, brooms, scrapers and trenchers.

#### 28

#### Reflective Pavement Markings

The Prismo method of marking traffic lines on highways and streets is illustrated and described in a 20-page bulletin of Prismo Safety Corporation, Huntingdon, Pa. The Prismo markings embody a basic reflective process by which microscopic optical glass spheres are embedded in a tough, semi-plastic

binder. The exposed sections of the spheres act as lenses, refracting and reflecting light. The bulletin contains illustrations and descriptions of Prismo installations. It also contains much useful technical and engineering data.

#### 29

#### Concrete Delivery Truck

"Why 23 big Ready Mix Men use Non-Agitating Equipment," is the name of a recent 8-page pamphlet issued by Dumpcrete Division, Maxon Construction Co., Dayton, O. This printed piece pictures each of the 23 central ready mix plants with name of city of location, together with a statement about the use of this low cost, versatile equipment.

## GREAT SLEEPS IN HISTORY

# Alice



...was the little girl who slept and dreamed of Wonderland. *Slumberland* is the favorite dream of over a quarter of a million guests who annually rest on these wonderful, cloud-comfortable beds at

## CLEVELAND'S HOTEL HOLLENDEN

ROBERT P. JOYCE, GENERAL MANAGER

## NEW TORO HIGHWAY MOWER CUTS MOWING TIME IN HALF

Sickle driven by independent engine gives constant cutting speed regardless of tractor's traveling speed

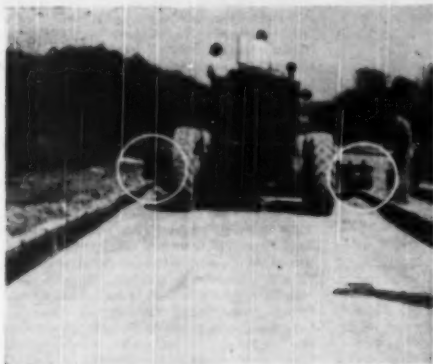


The new Toro "Roadmaster" cuts weeds, brush and saplings which are impossible to cut with conventional "power take-off" mowers. Its independently powered sickle maintains a constant cutting speed... shears through growth up to 2½" ... does a much cleaner job in half the time!

This low-slung tractor sticks on slopes steeper than 35°... mows over curbs from 1½" to 10" high... travels up to 48 m.p.h. between jobs. Fast acting hydraulic lift controls sickle at angles from 45° down to 90° up.

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**SAVE TIME:** These finegrading gauges are easily and quickly attached to any standard make grader. Can be changed from one width lane to another in a few minutes. Will not interfere with other operations of grader.

**IMPROVE QUALITY:** The ROADGRADER GAUGES will eliminate most of your concrete loss by assuring a superior fine grade throughout your job. Are excellently suited for long runs or short runs regardless of varying widths and are unscalped where special stabilization is required.

**SAVE MONEY:** As one of our many satisfied customers so ably states "In my 25 years in construction work yours is one of the most economical and accurate attachments I have yet witnessed." This plus the fact that the amount of subgrade that can be prepared with the ROADGRADER GAUGES will usually greatly exceed the capacity of the paver is one of the many reasons why so many contractors are turning to ROADGRADER GAUGES.

**WRITE:** today for full details on how these proven finegrading Gauges will save you time and money on your concrete paving jobs.

## ROADGRADER GAUGE CORPORATION

EQUITABLE TRUST BUILDING

WILMINGTON DEL

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30

### Asphalt Expansion Joint Remover

The rotary asphalt expansion joint remover manufactured by the San Jose Pipe & Tank Co., San Jose, Calif., is illustrated and described in a circular issued by the company. Included is an instructive manual and parts list. A section tells how to operate the machine. Illustrations are included of the joint remover in use on various jobs.

31

### Atlas Duraplastic

A new 20-page, two-color commemorative booklet entitled, "A Decade of Atlas Duraplastic," published by Universal Atlas Cement Co., New York, N. Y., traces the 1939-1949 period of the origin, development and remarkable use-acceptance by the construction industry of Duraplastic air-entraining cement. The booklet describes how Duraplastic was developed originally to solve the problem of concrete pavement scaling due to the use of deicing salts; how its success in this objective, from 1939 on, revealed other characteristics which led to Duraplastic's adapta-

tion in other fields of concrete work; how its use has extended from pavement concrete to a wide variety of structural and mass concrete, as well as to concrete block, pipe, drain tile, silo staves and other concrete products. More than 50 typical installations made during the past decade are illustrated and captioned.

32

### How to Adjust Transits

To aid engineers in the field in adjusting surveying transits and wye, dumping and precision tilting levels, two new pocket-service booklets have been issued by W. & L. E. Gurley, Troy, N. Y. Adjustments of transits, suggestions on care and maintenance, and causes of mechanical and instrumental errors and their correction are included in Service Booklet "A", while Booklet "B" contains similar information on levels.

33

### High-Speed Synchronous Motors

A new eight-page, two-color bulletin on Tri-Clad high-speed synchronous motors has been announced by General Electric Co., Schenectady 5, N. Y.

It lists some of the applications for these motors, such as driving pumps, grinders, compressors, saws, beaters, fans, generators, conveyors, mixers, etc. Profusely illustrated, the bulletin gives

three typical installation stories, describes Tri-Clad protection, and discusses construction features, mechanical modifications, and direct-connected excitors for the motors.

34

### Asphalt Plants

A new circular issued by the White Manufacturing Co., Elkhart, Ind., describes portable pavement repair trucks with capacities up to 10 tons per hour and moderate size asphalt paving plants with capacities up to 30 tons per hour. The circular also announces availability of larger models equipped with vibrating separation screens, multi-compartment hot storage bins, dust collectors and with either regular volumetric control or with weigh scales. Illustrations of the equipment are given and specifications are included.

35

### Manila Rope

Useful information on manila rope, such as tensile strength, specifications, splicing, tying knots and sling angles, are contained in a booklet published by the American Manufacturing Co., Brooklyn, N. Y. The booklet contains a chart for matching rope to block and sections on how to select rope, how to rig block and tackle, how to splice and how to tie useful knots.



**FRANK SNO-PLOWS, INC.**  
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8  
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for Industrial Loaders  
Write for Catalog  
**White Mfg. Co.**    Elkhart    Indiana

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### 36

#### Rubber Conveyor Belting

The installation, care and maintenance of rubber conveyor belting are featured in a new booklet issued by Carlyle Rubber Co., New York, N. Y. The various subjects in the booklet include: Receiving and storage of belting, installation, how to repair belting, and making major repairs to carcasses and covers.

### 37

#### Mapping from the Air

A 4-page folder on aerial photogrammetry issued by Lockwood, Keeler & Bartlett, Inc., Brooklyn, N. Y., points out that the advantages of producing maps by photogrammetry are speed and economy, coupled with a degree of accuracy acceptable for a wide variety of work. For major mapping projects that must be executed rapidly, accurately, and economically, or under adverse terrain conditions, the photogrammetric method is stated to be especially suitable. The leaflet gives an elementary explanation of the principles

of aerial map making. It indicates the principal problems that enter into the interpretation of photos for mapping use, how they are overcome, and the degree of accuracy that may be expected.

### 38

#### Power-Driven Scythes

An automatic power-driven portable scythe, described in a recent bulletin of Hoffer, Inc., Richmond, Ind., is claimed to be particularly well adapted for cutting weeds and grass on rocky or uneven ground and around highway guard rails and traffic signs. The machine weighs only 24 lbs., has a 1 1/4 h.p. motor and a 30 in. double-oscillating cutter blade. Specifications are included in the bulletin.

### 39

#### Hydraulic Pipe Line Dredges

Much useful information on hydraulic pipe-line dredges of small and medium-sizes is contained in Bulletin 780 issued by Ellicott Machine Corporation, Baltimore, Md. Included in the bulletin is a section on the use of dredges for the production of sand and gravel. Another section covers the selection of proper size of dredge. Illustrations and descriptions of the various equipment of a suction dredge are included.

### 40

#### Clearing and Grubbing Winch

A winch developed by a contractor for use on his clearing and grubbing contracts is illustrated and described in an 8-page catalog issued by Al Evans Winches, Inc., Gloucester, Va. This winch is mounted on a tractor which transports it and supplies engine power. The winch has two speeds and neutral within itself, the drum axle being mounted on an eccentric and controlled by a shift lever on the side of the machine. Speed changes can be made under load.

### 41

#### Pressure-Creosoted Foundation Piles

A 16-page booklet designed to assist engineers, contractors and architects in the evaluation of pressure-creosoted foundation piles for various types of construction projects has been issued by the Wood Preserving Division of Koppers Co., Inc., Pittsburgh, Pa. In reviewing the conditions under which wood foundation piles should be pressure-creosoted and the permanent qualities of the treatment, the booklet cites important national, regional, and city construction codes which allow pressure-creosoted wood found-

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1. For latest information on any product you need in road-building, earth moving, heavy construction, etc., check items on this page, fill out coupon, clip page, and mail. If convenient, use typewriter or print. Or attach to your business letterhead. Give particular type, model, capacity, or other specific data on the blank line below. The blank line can also be used for naming items not listed. Address **ROADS AND STREETS**, Reader Service Department, 22 West Maple Street, Chicago 10, Illinois.

2. If you prefer, instead of mailing coupon, use business-reply card inserted in this publication. Just fill in our code numbers on blank lines, tear out, and mail.  
3. See also other uses of cards for obtaining data on any products or literature advertised in this issue of **Roads and Streets**.  
4. Cards are also usable for further information on any items described in the "New Equipment and Materials" or "Manufacturers' Literature" sections—see back part of magazine.

Check products below on which you wish us to obtain information for you:

#### I AGGREGATE:

- ☐ 1 Bins and Hoppers
- ☐ 2 Conveyors
- ☐ 3 Crushers
- ☐ 4 Portable Plants
- ☐ 5 Screens

#### II BITUMINOUS:

- ☐ 6 Batchers
- ☐ 7 Finishers
- ☐ 8 Distributors
- ☐ 9 Dryers
- ☐ 10 Heaters
- ☐ 11 Plants (central)
- ☐ 12 Plants (travel)

#### III CONCRETE:

- ☐ 13 Batchers
- ☐ 14 Buggies and Carts
- ☐ 15 Finishers
- ☐ 16 Joints, Exp. and Contr.
- ☐ 17 Mixers (under 1 yd.)
- ☐ 18 Mixers (1 yd. up)
- ☐ 19 Pavers
- ☐ 20 Reinforcing Steel
- ☐ 21 Road Forms (1000' set)
- ☐ 22 Tower
- ☐ 23 Truck Mixers

#### IV CRANES:

- ☐ 24 Crawler Mounted
- ☐ 25 Truck Mounted
- ☐ 26 Piledrivers

#### V GRADERS:

- ☐ 27 Blade, self propelled
- ☐ 28 Blade, pull type
- ☐ 29 Blade, under truck
- ☐ 30 Elevating

#### VI LOADERS AND TRENCHERS:

- ☐ 31 Front-end loader (tractor mounted)
- ☐ 32 Loader, bucket type and belt type
- ☐ 33 Trencher or Ditcher

#### VII HAULING EQUIPMENT:

- ☐ 34 Dump Truck
- ☐ 35 Other Trucks
- ☐ 36 Dump Wagons, tractor drawn
- ☐ 37 Flatbed Trailers

#### VIII PUMPS:

- ☐ 38 Centrifugal
- ☐ 39 Diaphragm
- ☐ 40 Piston

#### IX POWER UNIT:

- (Independent)
- ☐ 41 Gasoline
- ☐ 42 Diesel
- ☐ 43 Electric

#### X ROLLERS:

- ☐ 44 Power (Smooth)
- ☐ 45 Pneumatic Tire
- ☐ 46 Sheepfoot

#### XI TRACTORS:

- ☐ 47 Crawler
- ☐ 48 Rubber Tired

#### XII TRACTOR EQUIPMENT:

- ☐ 49 Bulldozers
- ☐ 50 Power Control Units
- ☐ 51 Rippers
- ☐ 52 Scrapers, tractor drawn
- ☐ 53 Scrapers, self-powered

#### XIII BUCKETS:

- ☐ 54 Clamshell
- ☐ 55 Concrete
- ☐ 56 Dragline
- ☐ 57 Orange Peel

#### XIV SHOVELS AND DRAGLINE:

- ☐ 58 Crawler (under 1 yd.)
- ☐ 59 Crawler (1 yd. up)
- ☐ 60 Truck Mounted

#### XV ROCK DRILLS, AIR TOOLS:

- ☐ 61 Air Compressors
- ☐ 62 Backfill Tampers
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- ☐ 66 Drills, tripod and wagon
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- ☐ 68 Paint Sprayers
- ☐ 69 Paving Breakers
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- ☐ 77 Soil Stabilizing Equipment
- ☐ 78 Spreaders, sand
- ☐ 79 Street Flushers
- ☐ 80 Street Sweepers
- ☐ 81 Welders
- ☐ 82 Cutting Torches
- ☐ 83 Hydraulic Jacks
- ☐ 84 Hydraulic Control Equipment
- ☐ 85 Hand Tools
- ☐ 86 Hoists, derrick type
- ☐ 87 Highway Guard
- ☐ 88 Snowplows, rotary
- ☐ 89 Snowplows, v or wing
- ☐ 228 Salt

## Use This Coupon

Other products not named above, or specific variety of the products checked

Title or Profession \_\_\_\_\_

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Name of your company or governmental dept. \_\_\_\_\_

Type of work for which equipment will be used \_\_\_\_\_

Street Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ County \_\_\_\_\_



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dation piles for permanent construction. Typical examples of the use of these piles in major construction projects are described and pictured. The booklet also discusses the use of pressure-cresoted piles in marine construction.

#### 42

##### Base-Plates for Pavement Joint

Useful information on **Keystone base-plates** is given in a new circular issued by **Keystone Asphalt Products Co.**, Chicago, Ill. These plates are designed to prevent infiltration of sand, silt and water at bottom of joint and thus reduce pumping and pumping damage to a minimum. The circular contains drawings of base-plate installations for various types of joint, and a detail showing the base-plate with supporting typical load transfer unit.

#### 43

##### 60-Ton Semi-Trailer

The **Easton Model T-63**, said to be largest semi-trailer ever built, is pictured and described in a folder issued by the **Easton Car & Construction Co.**, Easton, Pa. Rated at 60 tons, the practical capacity of the T-63 is stated to have proved to be considerably greater. The new trailer features a new type wheel suspension designed by Easton engineers. The company also has issued folders on its **Model TR-10** and its **Model TR-15** trailers.

#### 44

##### Concrete Vibrators

The new **50V Wyco** concrete vibrator catalog has been announced by **Wyzenbeck & Staff, Inc.**, 825 W. Hubbard St., Chicago, Ill. Many improvements are shown, such as replaceable rubber tips for vibrator heads, which are optional and interchangeable. Illustrated, with vital operating data, machines and parts are set up for convenience and clarity of understanding. Catalog contains complete information on both **Vibrators** and **Contractors Grinders**.

#### 45

##### Dust Control for Crushing Plants

The **Aquadyne** system of producing "wet water" for dust control in mines and stone plants is described in a folder issued by **Aquadyne Corporation**, 220 East 42nd St., New York, N.Y. In drilling operations, for instance, when **Aquadyne** solution is used instead of plain water at the drills, really wet drilling is stated to be assured. The solution also is stated to stop back-lash of dust during drilling, increase the effective life of the bits before reshaping; and increase the drilling speed.

#### 46

##### Wood Preservation

The **Osmose** process of treating wood is illustrated and described in a 16-page booklet issued by **Osmose Wood Preserving Co., of America, Inc.**, Buffalo, N. Y. By this process any wood species can be treated with inexpensive equipment and unskilled labor. The materials and equipment for wood treating by the process are illustrated and described. Three easy ways—dip, brush and spray—of applying the **Osmosalts** are pictured and described.

Illustrations of the use of **Osmose** treated timbers in the construction field and by municipal governments are given.

#### 47

##### Torque Converter

A booklet titled "**The New General Motors Diesel Engine—Torque Converter Unit**," has been published by **Detroit Diesel Engine Division**, General Motors Corporation, Detroit, Mich. In this illustrated booklet is complete information concerning what a torque converter is and how it functions—where and how it has been applied—and an invitation to power machinery users everywhere to use **Detroit Diesel** facilities in engineering particular applications in any field.

#### 48

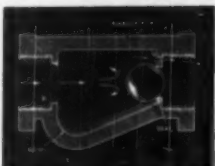
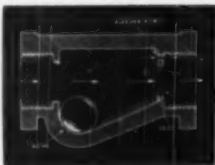
##### Planned Street Lighting

A 28-page illustrated booklet, titled "**Planned Street Lighting for Public Safety**," is available from the **Westinghouse Electric Corporation**, Pittsburgh, Pa. Published to provide practical help in the promotion of better street lighting, to provide useful help in the understanding of the street lighting problem, and to develop a workable outline to be used in planning street lighting programs, the booklet is divided into three parts dealing with these points: Part One discusses the need for public safety lighting in terms of traffic safety, crime and vagrancy, and civic progress. Part Two is prepared especially to enable the reader to recognize the problem, and the factors that make street lighting different from other types of lighting. The last part is concerned with planning a street lighting program, and lists the various types of lighting needs to be found in a typical community.

## NEWS! FOR PNEUMATIC EQUIPMENT USERS

It's the Safety Valve that Reduces your Operating Costs and Increases Safety Factor of Pneumatic Equipment.

HOW AND WHY IT DOES ALL THIS FOR YOU!



PATENTS PENDING.

The **Danielson Safety Valve** is a rugged, one-piece brass unit in which **ONE MOVING PART**—a stainless steel ball is locked.

This simple, dependable safety check, installed at compressor outlet, or manifold, shuts off all flow instantly when line is broken or uncoupled.

Ball, governed by air or gas flow through chamber, lies undisturbed in bowl under normal conditions. Excessive flow causes ball to go into shutoff position, with bleeder port open (Lower View). Gravity drops ball into bowl after line is ready for use.

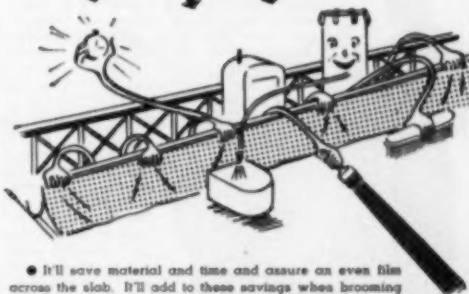
LOW-PRICED WIDELY USED  
WRITS FOR FOLDER AND PRICES APPROVAL NO. 2305  
CAL. DIV. INDUS. SAFETY  
Immediate Delivery on Stock Sizes 1/4" through 2" Dia.  
Larger Sizes on Special Order

**Danielson Safety Valves, Inc.**

224 SIXTH STREET

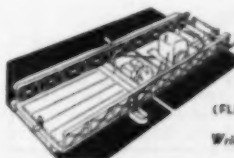
RICHMOND, CALIF.

that  
COST CUTTING,  
AUTOMATIC,  
FLEX-PLANE SPRAY-  
CURING MACHINE



• It'll save material and time and assure an even film across the slab. It'll add to these savings when brooming and permanent traffic line installing attachments are used on the spray machine and operated simultaneously.

To the basic spray machine, for small cost, any of these attachments may be added: Permanent Traffic Line Installer; Brooming; Belling or Boring Drilling attachments.



**FLEX-PLANE**  
WARREN OHIO

(FLEXIBLE ROAD JOINT MACHINE CO.)

Write for Bulletin J-100-A

## WITH THE MANUFACTURERS & DISTRIBUTORS

**New Secretary for A.E.D.**—Frank G. Knight has resigned as executive secretary of Associated Equipment Distributors to become executive assistant in the Bemis Equipment Corporation, Richmond, Va. He is succeeded by P. D. Hermann, who has been closely identified with many of A.E.D.'s activities since joining the executive office staff in March, 1948, as administrative assistant.

**Tom Coatney Promoted by Post**—Thomas L. Coatney, heretofore general manager of the southwestern division, has been appointed general sales manager of The Frederick Post Co., Chicago, Ill. Arthur C. Morales, former assistant manager, succeeds Mr. Coatney as manager of Post's southwestern division.

**To Represent Hose Accessories Co.**—Mercer Rubber Co., 1601 Maury St., Houston, Tex., has been appointed manufacturer's representative for Texas, Oklahoma, Arkansas and Louisiana by Hose Accessories Co., Philadelphia, Pa., manufacturers of Le-Hi high and low pressure hose couplings.

**Caterpillar Personnel Changes**—Dean Uhll, Western Division Service Manager has been appointed Export Service Man-

ager for Caterpillar Tractor Co., Peoria, Ill. He relieves Ralph G. Dunn, Assistant General Service Manager, who for many years has served as Export Service Manager in addition to his other administrative duties. Harrison Welch, Eastern Division Service Manager, becomes Western Division Service Manager. His position as Eastern Division Service Manager is filled by D. L. Lammers, a member of the Service Development Division.

**Burch Organizes Sales Corporation**—For greater sales efficiency and for the promotion of more intensive selling campaigns, J. L. Morrow, president of The Burch Corporation, Crestline, O., has announced the organization of The Burch Sales Corporation headed by E. S. Jenkins, president, A. F. Brooker, treasurer with J. L. Morrow, vice president. The corporation will have full charge of the sale of all equipment built by The Burch Corporation.

**Appointed Alcoa Advertising Manager**—M. Russell Kambach has been named advertising manager for Aluminum Company of America, Pittsburgh, Pa. Mr. Kambach, who has been assistant advertising manager since March 1, 1949, will be succeeded in that position by Jay M. Sharp of the Alcoa advertising department.

**New Huber Distributor**—John Bowman Co., Inc., 12 Water St., Bryn Mawr, Pa., has been appointed distributor for road equipment of Huber Manufacturing Co., Marion, O., to political subdivisions in a territory embracing five counties in the Philadelphia area. Private contractors and industries in these same counties

will be served by American Equipment Corporation, Mechanicsburg, Pennsylvania. This territory is in addition to the 22 Pennsylvania counties which American Equipment has served as Huber distributor for the past several years.

**New Warco Representative**—Robert D. Mathews has been appointed district representative in Missouri, Kansas, Oklahoma, Louisiana and Texas for W. A. Riddell Corporation, Bucyrus, O.

**New General Sales Manager for Rosco**—Harold Clark, for the past 2½ years, Eastern Sales Manager, has been appointed General Sales Manager for Rosco Manufacturing Co., Minneapolis, Minn. He will have charge of Rosco sales in the U. S. and Canada.

**Caterpillar to Erect New Plant**—Caterpillar Tractor Co., Peoria, Ill., has acquired 300 acres of unimproved land near Joliet, Ill., on which it will immediately start construction on a new factory to manufacture a large portion of the company's line of bulldozers, scrapers, wagons and rippers. T. R. Farley, vice president will be general manager of the new Joliet plant.

**New Marion Sales Representatives**—Marion Power Shovel Co., Marion, O., has announced the appointment of the following sales representatives: William W. Wilkinson for southern Indiana, southeastern Illinois and all of Kentucky, with offices at Evansville, Ind.; Melvin Kraft for New York City district offices of Marion Power Shovel Co., 2608 Graybar Bldg., New York.

## RUEMELIN *Portable* SAND BLAST GENERATORS



### FOR CLEANING BRIDGES—WATER TOWERS — STRUCTURAL STEEL

Many contractors use Ruemelin Blast Generators for cleaning steel work to remove rust, paint and scale before repainting. These machines are also used to remove laitance from cement wherever concrete construction is in progress. A wet adapting nozzle can be furnished to convert dry machines to wet type of operation.

Ruemelin Generators are built in several sizes, 400 lb. to 10,000 lb. capacity. Single or two hose outlets. We can care for your complete requirements, including blast hose, tungsten nozzles, operators' helmets.

Agents in principal cities. Prompt shipment on most sizes. Write for Bulletin 36-B.

**RUEMELIN MANUFACTURING CO.**  
1990 N. PALMER ST. • MILWAUKEE 13, WIS., U.S.A.  
Manufacturers and Engineers SAND BLAST AND DUST COLLECTING EQUIPMENT. WELDING FUME COLLECTORS

## Overlooking BEAUTIFUL BELMONT HARBOR IN *Chicago*

Hotel Belmont gives every traveler assurance of comfort and elegant service... nationally famous for its distinguished atmosphere, beautiful accommodations and splendid location. 700 luxuriously appointed rooms... Famous Cave Dining Room... Smart Cocktail Lounge... Excellent convention facilities.

Supervised by  
SECURITIES SERVICE CORP.  
CHICAGO

## Hotel BELMONT

Belmont and Sheridan, Chicago, 14



Write today.

**New Rosco Distributor**—Joe Meney Machinery Co., 903 Third Ave., West Birmingham, Ala., has been appointed distributor for Rosco Manufacturing Co., Minneapolis, Minn.

**Syntrom Moves N. Y. Office**—Syntrom Co., Homer City, Pa., has moved its New York sales and engineering office from its old address in Long Island City to 1860 Broadway, New York City.

**New Warco Distributor**—Berry Brothers Machine Co., Dallas, Tex., has been appointed distributor of Warco motor graders and Hercules road rollers for W. A. Riddell Corp., Bucyrus, O.

**New Federal Sales Representative**—Keith Holbrook has been appointed factory sales representative in the Salt Lake City region for Federal Motor Truck Co., Detroit, Mich. He will supervise factory sales programs and dealer relations in Utah, Arizona, Nevada, Northwest Wyoming, and lower Idaho.

**Wisconsin Motor Promotes Norton**—Phil Morton, general sales manager of Wisconsin Motor Corporation, Milwaukee, Wis., has been appointed vice president. He has been connected with the company in a sales capacity for over 20 years, occupying the executive position of general sales manager for the past 10 years.

**New Hyster Distributor**—The Northeast Industrial Equipment Co., Inc., Cambridge, Mass., is now handling sales and services of the lift trucks, straddle

trucks, mobile cranes and their attachment of Hyster Co., Portland, Ore., in a territory comprising Maine, New Hampshire, Rhode Island and 18 counties in Massachusetts.

**Casey Rejoins Detroit Automotive**—O. B. Casey has rejoined Detroit Automotive Products Corp., formerly the Thornton Tandem Co., as national service manager. He will supervise the work of field engineers in connection with a program for training the personnel of truck dealers and regional warehouse dealers.

**McGraw Promoted by Riddell**—Promotion of A. William "Bill" McGraw to the position of general sales manager, Warco-Hercules Road Machinery Division, has been announced by Jacques E. Jones, General Manager, W. A. Riddell Corp., Bucyrus, O. Mr. McGraw, who has an extensive experience in the sales and servicing of heavy construction machinery, will have complete charge of all sales activities of Warco motor graders and Hercules road rollers.

**Appointed Federal Sales Representative**—F. Jule Weiland has been appointed factory sales representative for Federal Motor Truck Co., Detroit, Mich. He will direct dealer relations and sales promotion campaigns in Wisconsin, upper Michigan and northeast Minnesota.

**P. & H. Appointment**—A. G. Hendrickson has been appointed assistant sales manager of the P. & H. Welding Division of Harnischfeger Corporation, Milwaukee, Wis. He has many years experience with P. & H. as welding engineer.

**Lawrence Named S.K.F. Vice President**—John Lawrence, heretofore factory manager, has been appointed to the newly created post of technical vice president of S.K.F. Industrial, Philadelphia, Pa., and will have charge of all manufacturing, engineering and research problems.

**Arthur Templeton Promoted**—Arthur Templeton has been appointed to the sales engineering staff of Templeton, Kenly & Co., Chicago, Ill., and will cover the Chicago territory. For the past four years he has been in the production department.

**General Tire Appointments**—William Kilgour and J. J. Mullen have been appointed territory representatives for General Tire & Rubber Co.'s New York branch. Kilgour will cover Orange, Sullivan and Dutchess counties and Mullen will cover Nassau and Suffolk counties in New York state.

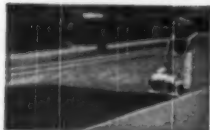
**Rice Pump Now Separate Corporation**—Rice Pump & Machine Co., Milwaukee, Wis., manufacturer of Rice centrifugal pumps for contractors, formerly a division of Milwaukee Chaplet & Mfg. Co., has been established as separate corporations. R. D. Houghton, formerly division manager, has been elected president and secretary.

**Appointed Sales Representative for Marion**—Ralph W. Kerr, heretofore assistant service manager, has been named sales representative for Marion and western Ohio for Marion Power Shovel Co., Marion, O. He succeeds John Hildinger, who resigned to accept a position with Depece Detroit Corporation, distributor for Marion equipment.

## a "10-TON ROLLER" that weighs only 240 lbs ....

Super-tamps, finishes, cures 45 to 60 sq. ft. per minute of bituminous or dry concrete pavement patching, mastic or cement composition floor base, or earth. Works flush to walls, curbs, tracks, manholes.

Striking 1900 blows per minute, each of more than 1250 ft. lbs. impact, the Wayer Impactor produces density greater than a 10-ton roller and in places a roller can't reach. Heated plate cures surface, ready for immediate traffic. Transports on material truck. One man operates. Big cost-savings.



Can work flush to any edge



Send for Bulletin 25.9 and name of distributor.

## WAYER IMPACTOR

Wayer Impactor, Incorporated, 12 N. Third St., Columbus 15, Ohio

*At last....*  
an AUTOMATIC  
POWER DRIVEN  
PORTABLE *scythe*

# Scythette

The Power Scythe

- ★ LIGHT . . . Aluminum built. Weighs only 24 lbs.
- ★ THRIFTY . . . Runs 6 hours per gallon.
- ★ SMOOTH RUNNING . . . Compact. Trouble-free. 1 1/2 h.p. motor.
- ★ 20-INCH . . . Cutter bar. Double-Oscillating. Extra size.
- ★ BALANCED . . . Easy to carry. Simple to handle.

Mfg. by

**Hoffco, Inc., Richmond, Indiana**

Please send me further information and prices on the

SCYTHETTE

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

### ARMY SURPLUS EQUIPMENT UNUSED & USED

## UNUSED CATERPILLAR TRACTORS

D7 - 1945 A.T. Series  
Complete with Double Drum, Power  
Control Unit and Cable Operated  
Straight Blades

### INTERNATIONAL HARVESTER TRACTORS

TD9 - TD14 - TD18  
Bare and completely equipped

### ALLIS CHALMERS TRACTORS HD5 - HD7 - HD10

**CRANES—LORAIN**  
**20-TON MODEL MC 40**  
**TRUCK MOUNTED,**  
P. H. Model 150, Crawler Complete  
with Shovel and Back Hoe

### TRUCKS

Fords, Jeeps, Dodges, Chevrolets,  
Studebakers, GMC's, Federals  
4 x 2's 4 x 4's 6 x 6's  
with and without winches

### TRAILERS—LOWBOYS

Flats, Vans, Stock Racks, Semi Tank  
2000 Gal. and 4000 Gal.

Fork Trucks, Karry Cranes,  
Krane Kars, Hyster Straddle  
Trucks, Cranes

**HUNDREDS OF OTHER ITEMS**  
**WRITE, WIRE OR PHONE**  
**FOR COMPLETE LIST**

## REX TRAILER COMPANY, Inc.

P. O. Box 203, Dallas, Texas  
Tel. Central 5350

### FOR SALE

1 1/4-yard MARION COMBINATION  
GAS-ELECTRIC POWER SHOVEL  
Type 450, complete with 24'6" shovel  
boom, 16' dipper handle and dipper,  
and 60' dragline boom. This  
unit has been overhauled and is in  
excellent condition. Write for full  
details and price.

### CRUSHERS

1—#6 Kennedy-Van-Saun gyratory  
crusher  
#37 Kennedy-Van-Saun gyratory  
crusher  
10" Traylor "Bulldog" gyratory  
crusher  
2'4" Traylor, type TY, fine reduction  
crusher  
3" Symons Cone crusher  
9"x15" Farrell jaw crusher  
9"x14" Cedar Rapids jaw crusher  
9"x24" Rogers jaw crusher  
9"x36" Cedar Rapids jaw crusher  
15"x20" Universal jaw crusher  
10"x24" Allis-Chalmers jaw crusher  
24"x36" Traylor jaw crusher  
A complete stock of Mining & Milling  
machinery, Construction, Industrial  
& Electrical equipment.

**Morse Bros. Machinery Co.**  
**DENVER, COLORADO**

### PORTABLE COMPRESSORS

#### Sales—Rental Rental Purchase

17 CFM LINDSAY  
38 CFM WORTHINGTON (Gas) 2 Phase  
68 CFM INGERSOLL (Gas) 2 Phase  
68 CFM CHICAGO (Gas) Single—2 Phase  
85 CFM INGERSOLL (Gas) 2 Phase  
105 CFM WORTHINGTON (Gas & Diesel)  
105 CFM SULLIVAN (Gas) Single—2 Phase  
105 CFM INGERSOLL (Gas) 2 & 4 Phase  
160 CFM WORTHINGTON (Diesel) 4 Phase  
218 CFM GARDNER DENVER (Gas) 4 Phase  
218 CFM WORTHINGTON (Gas & Diesel) 4 Phase  
315 CFM LARDI (Gas) 1 Phase  
315 CFM WORTHINGTON (Gas & Diesel) 4 Phase  
315 CFM INGERSOLL (Diesel) 4 Phase  
508 CFM WORTHINGTON (Diesel) 4 Phase  
508 CFM INGERSOLL (Diesel) Single—4 Phase

#### SEMI-PORTABLES

140 CFM to 308 CFM—Electric  
or Gas Drive

**AMERICAN AIR COMPRESSOR CORP.**  
Dell Ave. & 48th St., North Bergen, N. J.  
SINCE 1902

### USED EQUIPMENT

#### No. 101

Galion Motor Grader, Serial No. M3774, in  
first-class condition. Price \$4750.

#### Model 512

Adams Motor Grader, Serial No. 82, in first-  
class condition, equipped with UD14 diesel  
engine, 9'00-24 front tires, 13'00-24 rear  
tires, lights, wiper, electric starter with  
2 6V batteries, and a cab heater. This unit  
is about 2 1/2 years old. Price \$5000.

#### DB's

We have several for sale as-is or completely  
reconditioned.

#### No. 12's

We have three of these Motor Graders that  
we will sell as-is or reconditioned.

### CENTRAL MACHINERY CO.

Caterpillar Distributor  
GREAT FALLS, MAYBE, LEWISTOWN  
MONTANA

## FOR SALE OR RENT ALL LATE MODELS

1—Allis-Chalmers Tractor  
1—Caterpillar Auto Patrol  
5—DW 10's—3000 hrs. or less  
1—Caterpillar D8—Angledozer  
1—Caterpillar D7 Bulldozer

## WILLIAMS CONSTRUCTION CO.

Box 145, Middle River  
Baltimore 20, Md.  
Phone—Essex 1310

### WANTED

1 set, UD 18  
(3) Cummins M81 400  
G.M.C. 6-71  
Diesel Motors  
with or without  
Gear Box

**BUCKS COUNTY  
CONSTRUCTION COMPANY**  
PENNDL, PA.

### BARBER-GREENE MODEL 522

Bucket loader, swing apart discharge. Reconditioned  
by service men and in excellent condition. Price  
\$2,190.00 f.o.b. Terre Haute, Indiana.

J. B. FREEMAN

P.O. Box 225 Terre Haute, Ind.  
Phone Crawford 5413

### FOR SALE

One 1/2 yd. Ospeod Crane—one 1/4 yd. Keck-  
ing Crane M-301—one 1 1/2 yd. Thew Steam  
Crane. John D. Shotts Construction Com-  
pany, 1334 Sulphur Spring Road, Haleshorpe  
27, Maryland.

### FOR SALE

1 (new) General Electric Alternating current, 150  
Kw generator, 220 Volts, 60 Cycles, 3 phase, 500  
S.P.M., including the field motor and rheostat.  
Suitable for handling a good sized gravel plant.

**A. J. MANNILLIAN, INC.**  
North Adams, Massachusetts

### FOR SALE

One 1940 General 1/2 yd. shovel in excellent con-  
dition with new 10-60 1/2 yd. bucket attachment, 35  
ft. boom and 1/4 yd. dragline, new Dodge K-42B engine  
and new set of track pins installed in 1940. Machine  
may be seen at Powers Road & Gravel, Burlington, Wis.

PRIME-BEST, INC.

3920 W. Villard Ave.  
Milwaukee, Illinois 9-8708

### EXCEPTIONAL BARGAIN

1949 Allis-Chalmers Model BD-2 Tandem Drive Motor  
Grader Complete with Scarifier. Used very little, will  
sell at big discount.

See NICK HASPRT  
or HOWARD MUSEL  
HECTOR, MINNESOTA Ph. 189 or 5

### SALE OR RENT

1—Northwest Model 25 Grader, Motor & Eng. (rent  
only)  
1—Hargrave-Dye 37-B Crane, Motor & Eng.  
4—Kubota, Daimler-Benz, Model W100  
1—Allis Model 415 Motor Grader  
1—LePrieux Model 3000 Crane

**A. T. NOLAN CO.**  
20 N. 2nd St. Minneapolis 1, Minn.  
ATLantic 8109

## FOR SALE

Cats—D-7's, D-8's & TD-24's  
Cat. 12 Patrols  
8 Peterbills with 26.7 cu. yd. S.W. Trailers  
4 Super C's—Cummins H8 powered  
Generators—Transformers  
Shale Cutter—Earth Drills  
Many other standard construction items.  
Complete list on application.

## HARLAN CONSTRUCTION COMPANY

REPUBLICAN CITY, NEBRASKA



## New and Used Equipment For Sale or Rent at Bargain Prices

To reduce our stock of new and used equipment quickly, we are offering the following at attractive prices. Nearly all the used equipment has been overhauled and put in first class condition in our own yard, and can be inspected there. All prices quoted F.O.B. Omaha, Nebraska, unless otherwise designated. Subject Prior Sale.

### AIR COMPRESSORS

1. Le Roi Model 69 on 2 pneumatic tires—new July, 1948. Good condition. Serial No. 211 X 467.
2. Jaeger Model 105 on pneumatic tires—good condition.
3. Le Roi Model 105, No. 203 X 340, on pneumatic tires—New in 1947.
4. Le Roi Model 100, No. 231902, on pneumatic tires—New late in 1947—Good condition.
5. Le Roi Model 100, No. 206491, on pneumatic tires—New 1945—Good condition.
6. Schram Air Compressor, Model 85, No. 13227.
7. Le Roi Model 105G2-E, No. 237289, mounted on 2 pneumatic tires. New in 1948.

### AIR TOOLS

We have in stock approximately 100 used air tools, mostly Thor, including paving breakers, humpers, rock drills, etc. These are in good condition at various prices.

### BIN-BATCHER

8. Butler 2-compartment, 105-ton capacity material bin with batchers

### BUCKETS

9. Blaw-Knox ½ cu. yd. Rehandling Bucket Model 604-1, H-2572. Practically new.
10. Omaha ¾-yd. Dragline Bucket, No. 7552—Good condition.
11. Blaw-Knox ½-cu. yd. Rehandling Clamshell Bucket, Model 604-1, H-3058. Good condition.
12. Blaw-Knox ½ cu. yd. General Purpose Clamshell Bucket, Model 666, H-2739. Good condition.
13. Williams 2 cu. yd. Dragline Bucket, Model GP-X, No. 5780. Good condition.
14. Blaw-Knox ¾ cu. yd. General Purpose Clamshell Bucket, Model 672, H-2745. Good condition.
15. Page ½ cu. yd. Dragline Bucket, 2-1493. Good condition.
16. Blaw-Knox 1¼ cu. yd. Rehandling Wide Barge Type Bucket, Model 7125, AA-7062. Good condition.
17. Blaw-Knox 1 cu. yd. General Purpose Bucket, Model 680, AA-3376. Good condition.
18. Omaha 1 cu. yd. Standard Dragline Bucket, No. 3303. Fair condition.
19. Blaw-Knox ¾ cu. yd. General Purpose Bucket with teeth. Model 672, H-3282. Good condition.
20. Gar-Bro 1½ cu. yd. Concrete Bucket, No. 2723. Good condition.

### BULLDOZER

21. New Wooldridge BD7, No. 7250. Equipped for use with D7 Tractor

### COAL LOADER

22. New Barber-Greene Self-Propelled Model 92, No. 92-48-2, 5 H.P. electric motor, 220-480 volt

### CONCRETE FINISHERS

23. Jaeger Model D Concrete Finisher, adjustable 20 to 25'. Not overhauled, but in working condition.
24. Lakewood Concrete Finisher, 17'6" width. Not overhauled, but in working condition.
25. Koehring Longitudinal Finisher, 20 to 25' width. Not overhauled, but in good working condition.

### CONCRETE SPREADER

26. Jaeger Model S20 for 18' to 22' slab. New in 1942. In good working condition. F.O.B. Lincoln, Nebr.

### DAGLINE CRANES

27. Buckeye Clipper, ¾ yd. Model 70 with 40' boom. No. 70-651. Powered with General Motors Diesel engine Model 371. Nearly new.
28. Bucyrus-Erie Model 32B, powered with Wisconsin gasoline engine. 55' boom, 1 yd. capacity. Completely overhauled.
29. Lorain Model L-30 Crane, powered with gasoline engine. 35' boom, ¾ cu. yd. capacity. Working condition. F.O.B. Bayard, Nebr.
30. Sargent ½ cu. yd. 30' boom, gasoline engine, full swing. Fair working condition. F.O.B. eastern Nebraska.

### EARTH DRILL

31. Buda, Model HBJ, No. 1463, with drilling depth of 10 ft. Buda Motor HP-217, No. 314012. New

### FORM GRADER

32. Carr, Model A-36. Working condition

### DOUBLE DRUM HOIST

33. Sauerman Hoist PP-GT 1194. Hercules 6 cylinder motor. With large drums and high line speed for drag scraper operation. Capacity ¾ cu. yd. Thoroughly overhauled.

### LIGHT PLANTS

34. Onan, 1500 Watt Model 15 DAL-381546. Practically new
35. Kohler, Model 5M1, Serial No. 61173. Good condition

### MIXERS

36. 14S CMC, No. 30114. Has been completely overhauled and is in good running order. Mounted on 4 rubber tires
37. Kwik-Mix 11S (Koehring), Serial No. 22621, powered with Le Roi Model XP-1 gasoline engine, 2 years old. Mounted on 2 rubber tires
38. Smith 11S with loader, batchmeter, water pump on 2 pneumatic tires. 3 years old. Overhauled, in first class condition

### POWER CONTROL UNITS

39. Wooldridge PCU WE 2 (DT) TM, No. 18283. This is a NEW unit for D7 Tractor, and is equipped with Universal Fairleads
40. Wooldridge PCU WE 2 TD-18, No. 18294. A new unit for TD-18 Tractor with Universal Fairleads

### PULVI-MIXERS

41. Seaman Pulvi-Mixer, Model MHD-72, No. 1338. Overhauled. In good condition
42. Seaman Pulvi-Mixer, Model MHD-72, No. 1250. Overhauled. In good condition
43. Seaman Pulvi-Mixer, Model MHD-72T-55K, No. M-2400. 4 speed transmission. NEARLY NEW

### PUMPS

44. Gorman-Rupp 6" Model H18A, No. 2224, D-201 Le Roi motor, mounted on steel wheels. Overhauled and painted. First class shape
45. Gorman-Rupp 6" Model H18, No. 67752. Hercules Motor, Model JXC. Overhauled. Good condition

### ROLLER

46. 1-Bros Model 167, Serial 2059, 13 wheel pneumatic tired roller. Fine condition

### ROAD PATROL

47. Caterpillar Model 12 Diesel Powered, Serial No. 9K-2457, with 4-13.00x24 heavy duty Firestone tires and 2-7.50x24 Firestone tires. Overhauled and in excellent shape. Tires nearly new

### SCOOPMOBILES

49. Scoopmobile Model B, No. PS3263 F, ¾ yd. capacity. Next to brand new
50. Scoopmobile Model B, No. PS-3259 F. Next to brand new

### SCRAPERS

51. Wooldridge 6 cu. yd. Model BBM-4, No. 20057. Mounted on 4-14.00x20 tires. NEW
52. Wooldridge 6 cu. yd. Model BBM, No. 20055. Mounted on 4-14.00x20 tires. Used
53. Wooldridge 8.5 cu. yd. Model BB85, No. 38001. Mounted on 4-16.00x20 tires. Good condition
54. Wooldridge 14 cu. yd. Model BBU, No. 16792. Mounted on 4-16.00x24 tires. Good condition

### TRAILERS

56. Jahn 22-ton Single Purpose Model 622T, No. 2330, equipped for hauling 304 Koehring, 15B Bucyrus or 25 Northwest. Has mechanical brakes. NEW
57. Jahn 13-ton Semi-Trailer, flat bed with vacuum brakes. Also equipped with converter dolly to make full trailer. Good condition. Tires fair

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- 3-TOURNAPULL Super C with Scrapers and Rock Wagon. Has all new tires on all 3 units. Excellent condition. Bought new in 1946. \$25,000 takes all 3 units. Must be seen to appreciate.

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- 1-Used Sullivan 2-stage, air cooled WL-60 air compressor, 438 CFM displacement at 870 RPM, 75 HP required.

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D8s - D7s - D6s - D4s - TD9 and 14s  
Available with Dozer and other attachments

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- 1-No. 56 Pioneer portable crushing plant powered by two D17000 Caterpillar Diesels equipped with 30-inch x 42-inch primary crusher, 24-inch x 54-inch roll crusher and with 40-inch x 12-foot traveling grizzly.

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- 3-LeTourneau Tournapulls

- 1-2½ Yd. Marion dragline with 85-foot boom extension

- 1-820 Lorain Shovel with dragline attachment, Serial No. 15344

- 2-Caterpillar D-7 Tractors with dozers, Serial No. 3T-1548 and 7M-1414

- 1-Caterpillar D-8 Tractor with dozer, Serial No. 2U-1239

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1 Genco pneumatic tired roller, like new.  
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1 Universal 21x42 screening plant, complete with vibrating screen, motor driven.  
1 25 ft. Vagabond trailer house, fully equipped, in very good condition.  
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This equipment may be examined at my place.

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Submarine Cable (new reel of 410 ft. "Ananada") 1 wire cable, 2-0-3mm soft covered with lead and 25 No. 6 galvanized wires over the lead. Price \$825 FOB Lincoln, Ill.

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1 (small brand new 50 H.P. Model J.K.C. Hercules gasoline driven Power Unit with twin disc clutch.  
1 (Qest used NGVD two drum gasoline powered gravel bank cable drag line, with ½ yd. crescent bucket, suitable for feeding a medium sized gravel plant.

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1941 Pioneer washing & screening plant w/bins, flumes, & sand drag. Nearly new 6" Hetherington-Berner material handling pump w/110 H.P. M-M motor mounted on 12 x 20 aluminum covered barge w/winch & endless drive. All in A-1 condition. Ready to go to work. Sacrifice price, \$6,000.00.

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- 5-D8 Caterpillar Tractors, 8R, w/dd pcu's and dozers \$ 9,000.00 ea.  
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7-Super "C" Le Tourneau Tournapulls 7,000.00 ea.  
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1 — **HYSTAWAY CRANE** and  
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Tagline and Ecco one-half cubic yard drag  
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**CHAUTAUQUA COUNTY**  
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One HD 14 Allis Chalmers Tractor, Serial  
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Angle Doser and Double Drum P.C.U. Total  
hours of use, 1900. Unit rebuilt at 1500  
Hours. Very Good Condition. Price  
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One Model D-3 Wisconsin Gasoline Engine,  
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1—2' RYMONS STANDARD CONE CRUSHER  
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1—36" STEEDMAN IMPACT TYPE CRUSHER  
Crushers will be available about February 1, 1960;  
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THIS tractor with D11 P.C.U. and postplate, approx-  
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Price below \$2500 on 0-00 x 20 duals.  
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- 1—TD9 International with Hurl Angle Doser.
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- 1—Single drum winch for TD18 Tractor

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Cedarapids Pitmaster portable crushing and screening plant with power.  
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1 Buckeye Clipper Dragline like new.  
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1—American pulverizer with 125 HP motor  
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1—Vacuum pump  
1—Deck hoist  
All steel dredge boats and tug boats  
Electric motors AC  
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Air Compressors  
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Link Belt pan conveyors 36" x 22' centers  
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1—Fuller-Kinyon rotary compressor  
Wood and steel bins, hoppers and tanks  
Fuller-Kinyon pump 6"  
1—18' x 180' kiln with new liners  
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1 Colby crane Model 200 Whirley  
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10-ton TM-16 MICHIGAN truck crane.  
Less than 80 hours total time, \$9,780.00

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"CATERPILLAR" Diesel D4 Tractor—Serial No. 5T5574, 60" Gauge, w/13" Gr. Track Shoes, Electric Starter and Lights. Large Front Idlers, and LaPlant-Choute Hydraulic Angledoser. Reconditioned. F.O.B. Amarillo \$4,800.00

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1—Stinson Voyager 150, 4 place airplane, 357 actual hrs. Always hangared, never cracked up. A-1 condition ready to fly. Licensed, purchased new 1947.  
Could use tandem drive motor grader or small ladder type trencher, or front end loader, or what have you that you may want to trade.

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MOTOR GRADER: Caterpillar No. 12 Diesel Tandem Drive. Serial No. 9K444, excellent condition. Good tires. \$6,500.

SCRAPERS: 7 yard Continental 2 wheel scrapers. Six and 8-yard Le Tourneau scrapers. Bargains.

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1—TD15 IHC Tractor 1946 with Heil DDP-CU and Bucyrus-Erie Cable Dozer.

2—TD15 IHC Tractor 1947 with Heil D.D.P.C.U.

1—HD15 A.C. 1947 with Garwood D.D.P.C.U. and Cable Dozer.

1—LaPlant-Choute C84 Scraper.

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Equipment is all in good working condition and priced to sell.

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1—Caterpillar No. 12 motor grader, rebuilt.  
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1—35-ton low bed trailer.  
2—315 c.f. Ingersoll-Rand air compressors, 2 stage.  
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1—1/2-yd. Lorain pull shovel combination, rebuilt.  
1—Rex 145 mixer, slightly used.

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1—Sullivan Model WN1125 "Y" Type Stationary Compressor, capacity 773.5 CFM Actual Cylinders 15 1/2" x 6 1/2" x 7 1/2" complete and driven by D-17000 Caterpillar Power Unit through 16 "V" belt drive. Unit has been completely overhauled at over \$4000.00 cost, both compressor and engine are late serial numbers. We offer this unit in A-1 guaranteed condition for \$12,500.00 f.o.b. care, Northern California.

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CLUTCHES  
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Allis-Chalmers Model WK w/-  
Baker bulldozer. Very clean.

Model T-D6 Tractor with Bu-  
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Model HD14-C Tractor with  
Double Drum Control unit.

1—Allis - Chalmers Model B  
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Allis-Chalmers Model L Tractor  
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1—Allis-Chalmers Model HD-  
10W tractor w/Gar Wood  
Model CU-2 cable control  
unit & tiltdozer.

1—Galion 10' pull-grader on  
rubber.

1—Model Gar Wood 511  
Scraper.

1—LeTourneau L. S. Scraper.

3 cu. yd. 2 wheel Gar Wood  
hydraulic scraper. Like new.

LeTourneau DCU & 3 1/2 cu. yd.  
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1—Slightly used 1949 Mack  
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Equipped with Tulsa winch,  
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1—Slightly used FWD Model  
HG w/ Hell dump body,  
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New winch-lift trailers—12 and  
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60 in. x 20 ft. Fifth wheel mounting  
Low pressure Air—Johnston Burners with  
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Hot and cold Bucket Elevators

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About 60 Tons per hour

Ready to go to work \$5000.00

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At present our inventory of steel shapes and  
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6" I beam to 36" Girder Beam.

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30 ton Orion diesel locomotive crane

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800 CFM Chic. Pne. air compressors

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2 1/2 yd. Bucyrus 54B dragline. New 1948

2 yd. P&H 855 dragline. New 1948

100 HP American 3 drum elec. hoist

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DE W.P. Wackens power unit.

50 H.P. Chrysler motor and high pressure pump.  
Complete crushing, washing and screening plant.  
Mounted on tandem trailer. None as it is.

2—20 ft. x 10 in. conveyors, power mounted (electric).

1—34 ft. x 18 in. conveyor.

All conveyors are mounted with belt as good as new.

Bodge truck 1940, 4x4, 1 1/2 ton, new engine, double  
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Would like used 10 yd. scraper, 20 ton tandem  
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One Allis-Chalmers Model AD3  
Motor Grader with cab.  
Good Condition. Sec. \$5,000.00.

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NEW AND USED

ALL SIZES

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1—Buckeye Power Control Unit for AC—HD14,  
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1—Buckeye-Lin. Power Control Unit, Model P-38,  
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4—Firestone Earthmover-Tyres Tires Size: 24 x 32  
—38 Ply . . . Reasonable

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FOR SALE: 1941 Ford 1 1/2-ton truck, equipped with  
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sides and radiator grille; new and modern; cab-  
mounted headlights and blue light; new paint job;  
suitable for township, county or contractor. Contact  
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## 20,000 BARREL TANK

60" dia. x 41' high  
Steel cone roof with structural roof supports. De-  
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Biers Model B1 dragline  
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Butler: Concrete

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Bay City 10 Ton Crane, 50' Boom, 10' Jib.  
Square wheel and tire. Extra counter weights, Crane in  
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Room 200

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Caterpillar W10 Bottom Dump Wagons 14  
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Hyd. Scrapers 11.5 yd. A1 condition.

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1 (one) brand new 50 H.P. Model J.X.C. Hercules gasoline driven Power Unit with twin disc clutch.  
1 (one) used NOVO two drum gasoline powered gravel bank cable drag line, with 1/2 yd. crescent bucket, suitable for feeding a medium sized gravel plant.

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**WATERPROOFED — MILDWEPROOFED**  
18 months before treatment—18 months after treatment. Double stitched, complete with reinforced corners and zippers.  
Contractors' Special 18' x 20'—\$15.50  
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We will Shovel Your Name Free of Charge on request  
**PROMPT DELIVERY ON ALL ORDERS**  
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**JAE PORTABLE BITUMINOUS**  
10 to 14 cubic foot Cold Mix Plant.  
Must be in good condition.  
**GORDON LACKEY**  
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## FOR SALE

1—Acme 10-20 Crusher & new Elevator \$1,500.00  
1—1947 Cab. O.E. Ford 4 yd. body Dump Truck 1,500.00  
1—1950 Speeder Shovel & Back Hoe 2,500.00  
Office Wyckoff 4-0396 Box Wyckoff 4-0888  
**KIMBLE BROS., INC.**  
Franklin Ave. Campgaw, N. J.

## FOR SALE

Allis-Chalmers 18C dozer—S.N. 5257 DDPU—Angle, tilt blade. Completely rebuilt & painted this Feb. by A. C. distributor. Records available.  
Priced to sell.  
LaPlant-Choate 13 1/2 yd. scoop. New shires, rollers, bearings. Tires 90% new.  
Less than 1/2 new price.  
1947 27-ton tandem axle LaCrosse lowboy, only 4,000 miles. & Cab-over-fractor, 10 speeds, 529 in motor A-1 condition, 17,000 miles.  
The best buy.

These 4 pieces ready for work.

Wire, Phone or Write  
**FRED HOUSEWEY**  
532 Stevens Ave. Sycamore, Ill.  
Phone: 1032W

## FOR SALE

1 Cleveland Trencher M4, 116, Ser. 2 0020, \$2900.00  
1 Barkhoe Ditcher, M4, 416, Ser. 2 4224, 4800.00.  
**WANTED**  
1 Barkhoe Attachment for TL 20 Crane.  
**BUCKEYE TRENCHING CO.**  
12721 Woodland Ave.—Cleveland 20, O.  
Phone IV 1-2802

## USED CONSTRUCTION EQUIPMENT

### PRICED TO SELL

Includes tractors, patrols, trucks, compressors, crushers, power units, roadmix machines, rollers and shovels.

Write for complete information.

**NORTHWESTERN  
ENGINEERING CO.**  
Rapid City - South Dakota

## EVANS HEATERS

"ALL USE PORTABLE"  
HEATING UNIT

EXCELLENT FOR:  
Sub Zero Weather  
Construction Work  
of All Kinds

Keeping Trucks &  
Equipment Warm  
All Farm Uses

Complete for installation, with directions, gas tank, brackets, etc.

**\$33.50**

MAIL ORDERS & INQUIRIES  
GIVEN PROMPT ATTENTION

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## ROSHOLT'S EQUIPMENT BARGAINS

1—International Model TD14 Diesel Crawler with Superior side pipe Boom.  
1—International Model ID6 Wheel Tractor with Hough Front End Loader.  
1—Huber 10-Ton Three Wheel Roller.

**ROSHOLT EQUIPMENT CO.**  
3138 Scolling Ave., Minneapolis, Minn.  
Dapost 8351

## FOR SALE

One Model 3—LDT—63W 18 cu. yd. Bottom Dump Euclid 1942 Model with Cummins Super Diesel Engine in good condition. Has seen little use.

One Caterpillar 40 Tractor with La Planta-Choate Hydraulic Bulldozer Blade 1936 model in good running condition. Located near Detroit. Offered subject to prior sale by

**CYRIL J. BURKE, INC.**  
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DETROIT 12, MICHIGAN

## WM. K. HOLT MACHINERY CO.

P.O. BOX 650  
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PHONE KENWOOD 7110

**CATERPILLAR**—6 cyl. D6 with LaPlant-Choate inside mounted hydraulic Dozer and Hyster D6N worm drive winch, rebuilt & guaranteed, f.o.b. Corpus Christi, \$5,300.00.

**CATERPILLAR RD7**, with LeTourneau Cable Dozer, reconditioned—f.o.b. San Antonio, \$4,750.00.

**3 CATERPILLAR DW10's**, with Choate CW10 Scrapers, rebuilt & guaranteed, rent or sale. Price on request.

**IHC TD14**, with Bucyrus-Erie hydraulic Dozer, reconditioned—f.o.b. San Antonio, \$4,350.00.

**IHC W8 WHEEL TRACTOR**, used only 1,000 hours. Excellent condition—f.o.b. San Antonio, \$2,250.00.

**CASE**—Model LAI with large industrial tires—f.o.b. San Antonio, \$2,950.00.

**LeTOURNEAU Tractor Crane**—New, Model AD3, weight 6,760 lbs., mounted with four 12.00x20 pneumatic tires, three alone worth the price—f.o.b. San Antonio, \$550.00.

## THE GIROD COMPANY, INC.

P.O. Box 867  
VICKSBURG, MISSISSIPPI

Sealed bids will be received by this firm until May 19, 1958, at 3:00 P.M., and then publicly opened for the sale of the following surplus equipment:

14 2-cu.-yd. Blaw-Knox Hi-Boy Trunkmixers, mounted on Chevrolet G.I. 4 x 4 Trucks. Trunkmixers are 1947, 1948 and 1949 models.

Bids may be submitted for any or all units but must be for the complete units (Truck and Trunkmixer).

Equipment is in generally good condition and may be inspected at Greenville, Mississippi, after appointment with The Girod Company, Inc. at Vicksburg, Mississippi. The owners, who retain the right to reject any or all bids.

Inquiries should be addressed to the owners at the above address or to telephone 2958, Vicksburg, Mississippi.

## SURPLUS STOCK now available by principle in excess of present requirements:

Now, in original packages, ball and roller bearings, numerous sizes.  
Ball bearing electric motors from 1 to 125 horsepower, including a number of reduced voltage starters in original crates, motor-the-line switches and ammeters.

Several Diesel power units, with clutch.

All of the above well-known manufacturers. Subject to prior sale.

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2915 No. Market St. Phone: Newstead 1220  
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## TUNNEL EQUIPMENT

- 6—Ingersoll-Rand DA-34 wet DRIFTERS, 1 1/4" chuck (Round) with automatic power feed, sliding cone, steel centralizer, NEW YORK HEAD, mounted on 48" aluminum shell with column clamps. NEW April, 1949.
- 2—Ingersoll-Rand DA-35 wet DRIFTERS, 1 1/4" chuck with automatic power feed, sliding cone, steel centralizer, NEW YORK HEAD, mounting for 6" steel change, on pneumatic controlled DRILLING BOOM. NEW, Apr. 1949.
- 2—AXIVANE FANS, Model 25-1/4" x 3450 complete with 15 hp, 220 volt, 3 phase 60 cycle motor, with inlet ball, inlet screens, fan supports and adapters for 24" tubing. NEW, April 1949.
- 1—Garner Overshot LOADER, 2 cubic yard skip, Serial NO. 1002, mounted on Caterpillar D-6 TRACTOR—Serial NO. 9U2618, wide gauge with electric start, rigid bar and guards. NEW, April 1949.
- 1—Drill JUMBO for mounting 7 DRIFTERS, on Diamond T—10 ton 6 x 4 TRUCK—Suitable for 20' to 28' vertical height.

W. E. McILYAR

CONSTRUCTION COMPANY

BOX 289

GORE, OKLAHOMA

## EMMETT C. WATSON

Contractors' Equipment

Distributor, Rosco, 800 gallon, unmounted \$2250.00

Distributor, Littleford, Trail-o-Type, Model 3CTOD \$700.00

1—Guttersnipe broom \$1,200.00

1—Tank, gasoline, 2650 gallon capacity, 3 compartment, Freuhaut trailer mtd., nearly new tires \$550.00

1—Lima Type 34 combination shovel & crane with Cummins Diesel engine \$8,000.00

Welder, P&H, Model WG-300 \$800.00

Subject to Prior Sale

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SALES — SERVICE

## CRUSHERS, ETC.

- 1—Fair Bolla, Allis-Chalmers 40"x18", Anacanda, rebuilt and Rehabilitated.
  - 1—No. 6 Traylor Gyrotory Crusher with T.Z. head.
  - 1—No. 4 1/2 Traylor Gyr. Crusher.
  - 1—No. 5 Champion Jaw Crusher 11"x 26".
  - 1—4"x8" Tyler Hummer D. Deck Vibrating screen.
  - 1—18" Link-Belt Apron Conveyor—9" pitch, 27' centers, like new.
- Bucket Elevators, open and totally enclosed, new and used, as is or rebuilt.

JOHNSON & HOEHLER, INC.  
P.O. BOX 182 LANSBOWNE, PA.

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CATERPILLAR ALLIS-CHALMERS  
D8, D7, D6, D4 HD14, HD10, HD7  
INTERNATIONAL TD18, TD14, TD9, T9

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NORTHWEST	P&H	LORAIN
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KOEHRING	LIMA	INSLEY
802, 304	802, 34	K14, K12

LINK-BELT K340 UNIT 1020 OSGOOD 200  
BAY CITY 20 UNIT 514 BUCKEYE 70

### MOTOR GRADERS

CATERPILLAR No. 12 & No. 112  
AUSTIN 99M

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TRUCKCRANES	CARRYALLS
TOURNAPULLS	SCRAPERS
SHEEPSFOOT TAMPERS	DITCHERS
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RIPPERS	BUCKETS

800 UNITS IN STOCK

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1. Lot of Concrete Board, Sub-grade boards, Box grade boards, Vibrators and other items in Concrete Construction, Long Run Price \$1,000.00
2. 1—HD-16 Allis-Chalmers Bulldozer with Baker Hydraulic Blade, purchased new 1948 \$9,000.00
3. 1—HD-16 Allis-Chalmers Bulldozer with Baker Hydraulic Blade, also equipped with double drum power take-off for scraper work \$8,500.00
4. 1—LeTourneau Tournapull, 12 to 15 yd. capacity, Buser C, purchased new 1948, 150 H.P. Cummins Diesel motor \$5,500.00
5. 1—Heavy duty Gypsum Combination Crane & Shovel Equipped with 40 boom, 1 yd. Blaw Knox bucket also equipped with shovel front and dipper stick. Has new 90 hp. G.M. diesel motor \$7,500.00
6. 1—TD-18 International Tractor with 12' Bulldozer blade, also equipped with double drum power take-off for scrap or work. New 1948 \$8,500.00
7. 1—Garwood 12 to 15 yd. Pan. Purchased new March 1948 \$4,000.00
8. 1—D-7 Caterpillar Tractor with Bulldozer Blade, also equipped with double drum power take-off for pan or scraper work \$5,000.00
9. 1—Big Ransome Mixer equipped with batch motor, on four pneumatic tires, also equipped with roller, and 3 pneumatic fired concrete carts \$1,200.00

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With or without drilling equipment. Sub contractor work. By explosives—anything that is legal. Precision blasting of towers, stacks, drainage ditches, stone quarry work, and heavy equipment foundations, etc., inside or outside. Service by plane when needed. Emergencies have priority. Day or night call 12-F-14.

C. MORRIS BOYLE  
KIMBALL, NEBRASKA

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- 1—Koehring 105 mixer.
- 1—Koehring 145 mixer.
- 1—Huber 10 ton, three wheel roller w/power steering.
- 1—Insley Model K-12, 1/2 yard crawler shovel, w/shovel front, 40 ft. crane boom.

Allis-Chalmers HD10 with Angle Doser. Smith 16S Mixer on Rubber.

The above equipment is good to excellent condition

SALES—SERVICE—RENTALS

BISCHOFF MACHINERY CO.

Phone 444—Evening 517  
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## FOR SALE

### CLOSING OUT

### USED CONTRACTORS EQUIPMENT

Blaw Knox concrete paving finishers, Jaeger concrete spreader, subgrader, Owen digging bucket 1/2 yd. & 3/4 yd. Hyppressure Jenny 12"x12" single stage electric pump.  
4" diaphragm pumps (gasoline power). 2 stage jet pump, electric welder (gas-power).

### COLLIGNON

CONSTRUCTION COMPANY  
DAVENPORT, IOWA

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1 Cummer hot mix plant complete with 1 ton mixer. Capacity 25 T.P.H.

### IN OPERATING CONDITION

Write or phone: Main 1955

THE W. N. GATES CO.

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## 8-Yd. CAPACITY "HEIL" BUILT HYDRAULIC DUMP BODIES

Box 13 1/4" long  
7 1/2" wide  
2' 2" deep

—With 16,000-Lb. "Eaton" 2-Speed Axle Assembly. With Heavy-Duty Frame Section, Springs, Etc.

Adaptable to almost any make or model, long wheel-base trucks (1 1/2 yd. or over). For Farm or Industrial Bulk Handling. Ideal for independent dump-trailer drive. An \$1,900 value!

**\$550**

\* HOISTS, BODIES AND AXLES SOLD SEPARATELY AT SIMILAR LOW PRICES—WRITE FOR PRICES

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New spare parts of Cedar Rapids Crushers, Screens and Conveyors, Bargain Prices

1—29-T Bucyrus-Erie Blast Hole Drill

1—Bucyrus-Erie 120-B Five-Yard Steam Shovel with New Spare Parts

NEW YORK TRAP ROCK CORP.

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"Quick-Way" 1/2 yd. Model J trench-hoe, mounted on Chevrolet chassis with tandem dual axle, Thorton drive. Ready to go, \$4,950.00  
 Lomas 1/2 yd. highlift loader on Oliver 80 Industrial tractor. Good condition, \$1,467.00  
 Huber 8 ton 3-wheel roller with scarifier, \$795.00  
 Buffalo-Springfield 8 ton 3-wheel roller with scarifier, \$1,195.00  
 O.K. portable air compressor 60 cu. ft. with hose reel, tool bases. Slightly used, \$1,825.00  
 Glodhill road grader. Good condition, \$395.00

**BAUER INDUSTRIAL SALES, INC.**  
 Phone: FR-2-6132      Worthington, Ohio

Caterpillar #12 Diesel Patrol Grader  
 TD-4 Crawler with BE Angle-Doser Blade  
 TD-14 Crawler Tractor with Hughes Keenan Boom  
 TD-9 Crawler  
 Chicago Pneumatic 315' Gasoline Compressor  
 Worthington Blue Brute 60 CFM Compressor  
 Galion Chief 10 Ton 3 Wheel Roller  
 Buffalo-Springfield 10 Ton Tandem Roller  
 Smith 2 1/2 Yard Truck Mixer  
 Buda Diesel Pumps 1000 GPM

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**TRACTORS**—Crawlers, any size or make, with or without equipment.—Also, Farm tractors, any kind.

**TRAILERS**—Lowboy, Platform, Stake, Stock, Van, Dump, Refrigerated.

**TRUCKS**—Pickups, Panels, Dumps, Stakes, Utility, Tractors, Tandems.

PHONE, WRITE OR WIRE, Condition, General Description, Make, Model and Lowest Cash Price.

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**FOR SALE**

5 HXC Hercules Engines. Used. All completely reconditioned within last year. One immediately available. Others available within 3 or 4 months. Also 5 transfer cases for above.

**DISTRICT SAND & GRAVEL CO.**

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**PRICED FOR QUICK TURNOVER**

"Cat" D7 tractor with cable bulldozer. Rebuilt our shop. \$6,500.  
 "Cat" D12 motor grader. Rebuilt. Good tires. \$6,500.

**MILLER HESSELBALCH & CO.**

215 N. 12TH ST.      OMAHA, NEBR.

**REBUILT CONSTRUCTION EQUIPMENT GUARANTEED**

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Caterpillar—Allis Chalmers International

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 Lorain—Koehring—Buckeye

**SHOVEL FRONTS UNUSED**  
 For North West 25—North West 6  
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Galion 10 Ton  
 Buffalo Springfield 10 Ton  
 Austin Western Tandem

**HYMAN-MICHAELS COMPANY**

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 Wobash 2-4911

**Bargains in Used Equipment**

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1 TD15 with Bucyrus-Erie bulldozer.  
 1 BGS Cletrac with 1/2-yd. front end loader.

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1 Caterpillar Model 11.  
 1 Adams Model 511.  
 1 Adams Model 511 with V plow and wing.

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1 Galion 2-5 ton portable.  
 1 Galion 2-5 ton tandem.

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1 Jaeger 75 cu. ft. portable.  
 1 Jaeger 125 cu. ft. portable.  
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 1 Ingersoll-Rand 315 cu. ft. portable.

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Thor paving breakers—all models.  
 Thor sinker drills—all models.  
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1 Buckeye Model 70, diesel powered.

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Jaeger 1 1/2" to 8" portables.  
 Jaeger 3" diaphragm portable.

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1 Universal Model 880 Jr. portable.

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Reversible blade plows for 1 1/2 to 2-ton trucks.

**THE GEO. T. RYAN CO.**  
 171 37th Ave. S.E.  
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Lorain Model 83 Hi Front  
 Lorain Model L810 Standard Shovel #15193  
 Marion Model 363 Drag or Shovel  
 Manitowoc Model 3500 Hi Front  
 Lima Model 1201 70 Front or Standard  
 P & H Model 1055 Drag or Hi Front  
 Osgood Model 300 Back Hoe  
 Osgood Model 300 Crane

**GRADERS**

Motor Patrol Caterpillar Model 10 Serial 1K332  
 Warren Diesel Tandem Serial VD145120  
 Allis Chalmers small, serial 1E43

**TRENCHERS**

Cleveland Model 85, 110, 140  
 Buckeye Model 410, C 15, C 10, C 224  
 Purnose Model 310 Diesel like new  
 P & H Model 10-30  
 Austin Model 105, 600  
 Barber-Greene Model 44C

**ROLLERS**

Huber 3 wheel Diesel, 10 ton Serial T4662  
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 Lewis 1 wheel Tandem, 2 1/2-3 ton

**COMPRESSORS**

Devey 105 Pneumatic Thru, 1943, good  
 Schramm Model 315 Diesel  
 Ingersoll-Rand Model 315 Diesel

**SHOVEL ATTACHMENTS**

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 Marion Model 363  
 Lakebelt L540  
 P & H Model 403  
 Buckeye Model 70 Clipper, New  
 Manitowoc 3000-A, unused—new  
 Northwest Model 6, 25, 600  
 Osgood Model 300, 1/2 yard  
 Lima 1201 Standard Front or Hi Front

**TRACTORS**

(20) D6 in 8 H series dozers  
 (10) D6 in 20 series dozers  
 (10) HD19 Allis Chalmers dozers  
 (5) D7 in 37 series dozers  
 (5) D4 dozers

**BUCKETS**

Orange 1/2 yd., 3/4 yd., 1 yd.  
 Sioux Knox Clim Shell 1 1/2 yd., 3 yd., 3 1/2 yd.  
 Williams Handling Climshell 3 yd.  
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**AIR COMPRESSOR RENTAL CO.**

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 Phone KEnmore 1-8000

**FOR SALE**

1—Hessner K-3 Tamper Block Machine  
 1—4" attachment  
 1—6", 8", 10", and 12" attachments also  
 1—Floor Tile machine attachment  
 2000—12 1/2" x 15" steel pallets  
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 1—Clark Platform lift truck  
 1—Shovel front for Michigan Power Shovel  
 Priced to sell

**NIEB CONCRETE PRODUCTS**  
 U. S. 31 & PORT ST.      NILES, MICH.

**FOR SALE**

Schield Barlow Crane, mounted on army half track, front wheel drive. Powered by 180 h.p. white engine. Crane unit used only 20 hours. Original cost, \$24,000.00. Will accept for \$12,500.00.  
 A-2 Model HD10 Tractor with 800 anglebar, completely overhauled. New rollers, idlers, rails, gears. 98% new. \$8800.00.  
 Bender Crane, 25 yd. 250, will handle 45 yd. re-handling bucket, 1000 lb. capacity boom, heavy machinery overhauled and rebushed. Will accept for \$2250.00.  
 P&H Model 225A, combination shovel and crane, less crane boom. 98% new. Bumpin at \$11,500.00.  
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We Invite You to Investigate the Price And Quality of These Shovels

- 1—LIMA SHOVEL, Model 1261, 2½ Cu. Yd., Serial 5213 High Lift Shovel, 45' Boom, 32' Stick, 1500 Watt Kohler Light Plant, Cummins Diesel Motor Type L, Year 1946.
- 1—MARION SHOVEL, Model 151-M, 6 Cu. Yd., Serial 6431, Electric, Shovel 2½/2300-4000 volts, with 38' Boom, 32' Stick, Also 45' Boom, 32' Stick and 3 Cu. Yd. Bucket, Year 1946.
- 1—LORAIN SHOVEL, Model 830, 2 Cu. Yd., Serial No. 15706, with Caterpillar D-13000 Engine with Kohler Light Plant, 23' Boom, 18' Stick, with 3 Cu. Yd. Coal Loader or Standard 2 Cu. Yd. Dipper, Year 1947.

### Mail Us Your Parts Inquiries!

We have a large warehouse full of all kinds of new parts for the above type and other equipment that will be sold at attractive prices. Let us know what you need, we probably have it.

For inspection and further information Write, Wire or Phone

**B. Perini & Sons, Inc.**

Box 138 Phone 444  
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### GOVERNMENT COST AND PRESENT LIST

PRICE—\$4,800

OUR SELLING PRICE  
F.O.B.—\$480.00



Fruehauf SMI Gasoline Tank Trailers, like new, 920 tires, 6 inch Westinghouse air brakes with landing gear, etc. All equipped and attachments.

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DOVER, DELAWARE

### HOLE DIGGING MADE EASY ATOM POWERFUL HYDRAULIC

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HOLE DIGGERS  
2" to 28" augers  
4' to 18' depth.  
Fast becoming a  
standard implement  
with good dealers.

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Diggers only or complete units for sale, for rent, for hire. We contract to dig holes 2" to 24" diameter—5' to 18' deep. We travel any place, including Canada, Mexico, and South America. We also dynamite drainage ditches and straighten streams to conserve soil. Reasonable rates. Truck and tractor units ready to go. For fast action, write, wire, call

**ATOM MFG. CO.**

Moline, Illinois

If You're in the Market . . .  
**THIS IS IT!**

### 2 EUCLID REAR DUMP TRUCKS

NEW 1947

MODEL—53 FD with 9-yard and dump bodies. Serial Nos. 6417 and 6416.  
POWER—6-cylinder 6, 64, Diesels. Serial Nos. 47114-1443 and 47114-5443.  
TIRES—Front 12.00 x 20—16 ply. Rear 14.00 x 20—28 ply.  
EQUIPMENT includes 15-inch Hydrotarders, spare wheels, tires. Both units in excellent condition, used less than 2000 hours each. Motors completely overhauled by General Motors dealer, August, 1949.

SALE PRICE \$12,500 EACH

F.O.B. Livingston, Montana

These trucks are available for inspection at any time at GORE, MONTANA

**The McLaren Gold Mines Company**  
1054 LaSalle-Wacker Building  
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### USED EQUIPMENT FOR SALE

- 1—2½ cubic yard ESCO Rock Dipper Serial 5077 with dogleg bail, \$2,100.00 Great Falls, Montana
- 1—Model 21-E Kuehling Concrete Mixer and Paver Serial 12041, powered by Waukesha Motor 77880, 21 cu. ft., \$2,500.00 Great Falls, Montana
- 1—14-S Concrete Mixer Serial H-9172, powered by LaRoi Motor Serial 60389, steel wheel mounted, \$800.00 Great Falls, Montana
- 1—2 cubic yard Lima Shovel, Amco Bucket, 50 foot dragline boom with 10 foot insert, \$17,500.00 Great Falls, Montana

### S. BIRCH & SONS CONSTRUCTION CO.

P. O. BOX 1926  
GREAT FALLS, MONTANA  
PHONE 3286

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"Caterpillar" Model 4400 engine in good condition can be used in a "Caterpillar" Model 6 tractor, grader Model 16 dirt wagon, Lima or Northwest shovel. Priced right.

CUMMINS DIESEL SALES CORP. OF OHIO  
741 Grandview Ave. Columbus 8, Ohio

### FOR SALE OR TRADE

½ yd. shovel front for S14 Unit dragline. Want trench hoe for above machine.  
42 in. Caterpillar elevating grader, machine No. K197, Motor 6A77—cheap.

Almost new, motor, transmission and rear end 522 model G.M.C. truck.

**EIKELAND & HOLMGREN**  
SAUDETTE, MINN.

### FIELD OFFICE TRAILER

Fully equipped. Indirect fluorescent lighting. Gasoline generator, oil stove. Three desks and chairs. Locker space. Windows all around. Insulated. 32 feet long. Side and rear entrance. Connected to K-6 International Trailer. Heater breaks. Complete unit—\$2250. SCHERTZER EQUIPMENT CO., 32 Prospect St., Somerville, Mass. SOmerSet 5-1407.

### AFTER INVENTORY EQUIPMENT BARGAINS

NEW

- Bros A6W hydraulic angledozzer for D-6 "Caterpillar." Serial #9-U-1 and up \$1600.00
- Murphy Diesel engine, Model ME6, 135 H.P. on skids \$4900.00
- LaPlant-Cheate C42 hydraulic scraper #505 for use w/ Oliver 900 wheel tractor \$2550.00
- Oliver Model 80 Ind'l wheel tractors (2) w/ Lull #2-D Universal Loaders—Each \$3150.00

USED

- Brownhoist crane #10146, capacity 10 ton at 12' radius, w/ Waukesha gas engine \$3500.00
- Sullivan WK-60 210' portable air compressor on four (4) pneumatic tires (3 units). Each \$1200.00
- Sullivan WK-60 315' portable air compressor on four (4) pneumatic tires \$1,800.00
- Hebard Shop Mule, Model J-233 w/ new I.H.C. engine. \$600.00

All Items F.O.B. Chicago, Ill.

**GREAT LAKES SUPPLY CORP.**

Atlantic 3-6422  
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### BARGAIN SURPLUS EQUIPMENT

- 1—FINE GRINDING MILL—3-Roll Raymond High Side Mill—Complete Less Motors—Late Model—Never installed—Brand New—Original Cost \$12,000.00—Will Take \$4,750.00.
- 1—AIR COMPRESSOR—Latest Model Gardner Denver 230—Powered with Caterpillar D-5800—Both Engine and Compressor Completely Overhauled at Factory—Mounted on GMC 6-Wheel Drive Truck—Truck Has Front Mounted 5-Ton Winch—Bargain at \$3,650.00.
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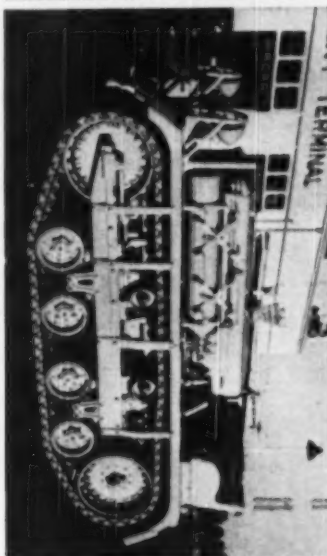
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